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STAR

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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
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Subject Categories of the Division A. Aeronautics

Select a category to view the collection of records cited.

01 Aeronautics (General) 1

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics see *categories 02 through 09*. For information related to space vehicles see *12 Astronautics*.

02 Aerodynamics 2

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery. For related information, see also *34 Fluid Mechanics and Heat Transfer.*

03 Air Transportation and Safety 16

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*. For related information see also *16 Space Transportation and Safety*; and *85 Technology Utilization and Surface Transportation*.

04 Aircraft Communications and Navigation 21

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *06 Avionics and Aircraft Instrumentation*; *17 Space Communications; Spacecraft Communications, Command and Tracking*, and *32 Communications and Radar.*

05 Aircraft Design, Testing and Performance 22

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles, see *85 Technology Utilization and Surface Transportation*.

06 Avionics and Aircraft Instrumentation 29

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For relatead information see also *04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics; and 35 Instrumentation and Photography.*

08 Aircraft Stability and Control 30

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also *05 Aircraft Design, Testing and Performance* and *06 Avionics and Aircraft Instrumentation*.

09 Research and Support Facilities (Air) 34

Includes airports, runways, hangers, and aircraft repair and overhaul facilities, wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operation see *03 Air Transportation and Safety.* For astronautical facilities see *14 Ground Support Systems and Facilities (Space).*

Subject Categories of the Division B. Astronautics

Select a category to view the collection of records cited.

12 Astronautics (General) 36

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration, see *91 Lunar and Planetary Science and Exploration*.

13 Astrodynamics 36

Includes powered and free-flight trajectories; and orbital and launching dynamics.

15 Launch Vehicles and Launch Operations 37

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing, and Performance; and 20 Spacecraft Propulsion and Power.*

16 Space Transportation and Safety 38

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information, see also *03 Air Transportation and Safety* and *15 Launch Vehicles and Launch Vehicles*, and *18 Spacecraft Design, Testing and Performance*. For space suits, see *54 Man/System Technology and Life Support*.

17 Space Communications, Spacecraft Communications, Command and Tracking 39

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information, see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

18 Spacecraft Design, Testing and Performance 40

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics.

For life support systems, see *54 Man/System Technology and Life Support*. For related information, see also *05 Aircraft Design, Testing and Performance*, *39 Structural Mechanics, and 16 Space Transportation and Safety.*

19 Spacecraft Instrumentation and Astrionics 42

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information, see also *06 Aircraft Instrumentation and Avionics;* For spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; For spaceborne telescopes and other astronomical instruments see *89 Astronomy, Instrumentation and Photography*; For spaceborne telescopes and other astronomical instruments see *89 Astronomy.*

20 Spacecraft Propulsion and Power 43

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also *07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations;* and *44 Energy Production and Conversion*.

Subject Categories of the Division C. Chemistry and Materials

Select a category to view the collection of records cited.

23 Chemistry and Materials (General) 48

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 24 through 29*. For astrochemistry see category *90 Astrophysics*.

24 Composite Materials 50

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

25 Inorganic, Organic, and Physical Chemistry 53

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also *34 Fluid Dynamics and Thermodynamics, For astrochemistry see category 90 Astrophysics*.

26 Metals and Metallic Materials 57

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

27 Nonmetallic Materials 60

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials.*

28 Propellants and Fuels 67

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

29 Space Processing 73

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced–gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy.*

Subject Categories of the Division D. Engineering

Select a category to view the collection of records cited.

31 Engineering (General) 74

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

32 Communications and Radar 76

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also *04 Aircraft Communications and Navigation;* and *17 Space Communications, Spacecraft Communications, Command and Tracking;* for search and rescue see *03 Air Transportation and Safety*, and *16 Space Transportation and Safety.*

33 Electronics and Electrical Engineering 78

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also *60 Computer Operations and Hardware;* and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar.*

34 Fluid Mechanics and Thermodynamics 85

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics.*

35 Instrumentation and Photography 90

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation;* and *19 Spacecraft Instrumentation*.

36 Lasers and Masers 95

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

37 Mechanical Engineering 96

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

38 Quality Assurance and Reliability 101

Includes approaches to, and methods for reliability analysis and control, inspection, maintainability, and standardization.

39 Structural Mechanics 103

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

Subject Categories of the Division E. Geosciences

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42 Geosciences (General) 105

Includes general research topics related to the Earth sciences, and the specific areas of petrology, minerology, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

43 Earth Resources and Remote Sensing 106

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see *35 Instrumentation and Photography.*

44 Energy Production and Conversion 108

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

45 Environment Pollution 111

Includes atmospheric, water, soil, noise, and thermal pollution.

46 Geophysics 120

Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology;* and *93 Space Radiation*.

47 Meteorology and Climatology 122

Includes weather observation forecasting and modification.

48 Oceanography 125

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

Subject Categories of the Division F. Life Sciences

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51 Life Sciences (General) 127

Includes general research topics related to plant and animal biology (non–human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

52 Aerospace Medicine 127

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

54 Man/System Technology and Life Support 130

Includes human factors engineering; bionics, man–machine, life support, space suits and protective clothing. For related information see also *16 Space Transportation* and *52 Aerospace Medicine*..

Subject Categories of the Division G. Mathematical and Computer Sciences

Select a category to view the collection of records cited.

59 Mathematical and Computer Sciences (General) 132

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

60 Computer Operations and Hardware 135

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

61 Computer Programming and Software 135

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

62 Computer Systems 146

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

63 Cybernetics, Artificial Intelligence and Robotics 152

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support.*

64 Numerical Analysis 155

Includes iteration, differential and difference equations, and numerical approximation.

65 Statistics and Probability 157

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

66 Systems Analysis and Operations Research 157

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

67 Theoretical Mathematics 158

Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.

Subject Categories of the Division H. Physics

Select a category to view the collection of records cited.

70 Physics (General) 159

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography;* for geophysics, astrophysics or solar physics see *46 Geophysics, 90 Astrophysics,* or *92 Solar Physics*.

71 Acoustics 160

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution.* For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion Propulsion and Power.*

72 Atomic and Molecular Physics 163

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

73 Nuclear Physics 165

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

74 Optics 166

Includes light phenomena and the theory of optical devices. For lasers see *36 Lasers and Masers*.

75 Plasma Physics 169

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics*.

76 Solid-State Physics 172

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 Physics of Elementary Particles and Fields 175

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics, 73 Nuclear Physics, and 25 Inorganic, Organic and Physical Chemistry.*

Subject Categories of the Division I. Social and Information Sciences

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81 Administration and Management 176

Includes management planning and research.

82 Documentation and Information Science 178

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see *61 Computer Programming and Software*.

85 Technology Utilization and Surface Transportation 180

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety, and 44 Energy Production and Conversion.* For specific technology transfer applications see also the category where the subject is treated.

Subject Categories of the Division J. Space Sciences

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88 Space Sciences (General) 181

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

89 Astronomy 181

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x–ray, ultraviolet, and infrared astronomy; and astrometry.

90 Astrophysics 182

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

91 Lunar and Planetary Science and Exploration 184

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

93 Space Radiation 187

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *52 Aerospace Medicine*. For theory see *73 Nuclear Physics.*

Subject Categories of the Division K. General

Select a category to view the collection of records cited.

99 General 188

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 38, JUNE 16, 2000

20000052254 Naval Air Warfare Center, Weapons Div., China Lake, CA USA

Standard Report Format for Global Positioning System (GPS) Receivers and Systems Accuracy Tests and Evaluations
Dickson, Dick; Feb. 2000; 28p; In English
Report No.(s): AD-A375388; GPSRAP-TR-98-0001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document is a guideline for Global Positioning System (GPS) accuracy reports. The standard report format outlined in this document provides guidance for preparing high level accuracy reports on commercial and military OPS receivers and UPS instrumentation systems.

DTIC

Global Positioning System; Positioning; Radio Receivers

01
AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

20000047290 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France
New Metallic Materials for the Structure of Aging Aircraft ***les Nouveaux Materiaux Metalliques Pour les Structures des a eronefs d Ancienne Generation***
New Metallic Materials for the Structure of Aging Aircraft; April 2000; 111p; In English, 19-20 Apr. 1999, Corfu, Greece; See also 20000047291 through 20000047296; Original contains color illustrations
Report No.(s): RTO-MP-25; AC/323(AVT)TP/13; ISBN 92-837-1029-0; Copyright Waived; Avail: CASI; A06, Hardcopy; A02, Microfiche; C01, CD-ROM

This workshop dealt with the replacement of Structural component of aging aircraft with components manufactured from materials with specifications of a high qualification, with enhancing various parameters including overall life cycle cost technology (LCC). The following topics were treated: An Overview Aluminium Alloys and Composites Processing, Fatigue and Durability.

Author

Replacing; Aging (Materials); Aluminum Alloys; Fatigue (Materials); Durability

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery. For related information, see also 34 Fluid Mechanics and Heat Transfer.

20000044865 NASA Langley Research Center, Hampton, VA USA
First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop
Wood, Richard M., Editor, NASA Langley Research Center, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999; 626p; In English; 1st, 27-29 Feb. 1996, Hampton, VA, USA; See also 20000044866 through 20000044881
Contract(s)/Grant(s): RTOP 537-07-20
Report No.(s): NASA/CP-1999-209690/PT3; NAS 1.55:209690/PT3; L-17574C; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

This publication is a compilation of documents presented at the First NASA/Industry High Speed Research Configuration Aerodynamics Workshop held on February 27-29, 1996 at NASA Langley Research Center. The purpose of the workshop was to bring together the broad spectrum of aerodynamicists, engineers, and scientists working within the Configuration Aerodynamics element of the HSR Program to collectively evaluate the technology status and to define the needs within Computational Fluid Dynamics (CFD) Analysis Methodology, Aerodynamic Shape ly, Desic,n, Propulsion/Airframe Integration (PAI), Aerodynamic Performance, and Stability and Control (S&C) to support the development of an economically viable High Speed Civil Transport (HSCT) aircraft. to meet these objectives, papers were presented by representative from NASA Langley, Ames, and Lewis Research Centers; Boeing, McDonnell Douglas, Northrop-Grumman, Lockheed-Martin, Vigyan, Analytical Services, Dynacs, and RIACS.
Author
Aerodynamic Characteristics; Aerodynamic Configurations; Engine Airframe Integration; Aerodynamics; Computational Fluid Dynamics

20000044870 NASA Langley Research Center, Hampton, VA USA
Initial Results of Reynolds Number Testing at LaRC's NTF Using the 2.2% Reference H Model
Owens, Lewis R., Jr., Editor, NASA Langley Research Center, USA; Wahls, Richard A., Editor, NASA Langley Research Center, USA; Hamner, Marvine, McDonnell-Douglas Aerospace, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1073-1107; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

To develop full scale flight performance predictions an understanding of Reynolds number effects on HSCT-class configurations is essential. A wind tunnel database utilizing a 2.2% scale Reference H model in NASA Langley Research Centers National Transonic Facility is being developed to assess these Reynolds number effects. In developing this database temperature and aeroelastic corrections to the wind tunnel data have been identified and are being analyzed. Once final corrections have been developed and applied, then pure Reynolds number effects can be determined. In addition, final corrections will yield the data required for CFD validation at q = 0. Presented in this report are the results of seven tests involving the wing/body configuration. This includes summaries of data acquired in these tests, uncorrected Reynolds number effects, and temperature and aeroelastic corrections. The data presented herein illustrates the successes achieved to date as well as the challenges that will be faced in obtaining full scale flight performance predictions.
Author
Scale Models; Flight Characteristics; Aircraft Performance; Performance Prediction; Reynolds Number

20000044871 Boeing Commercial Airplane Co., Seattle, WA USA
HSCT Ref-H Transonic Flap Data Base: Wind-Tunnel Test and Comparison with Theory
Vijgen, Paul M., Boeing Commercial Airplane Co., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1109-1141; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

In cooperation with personnel from the Boeing ANP Laboratory and NASA Langley, a performance test was conducted using the Reference-H 1.675% model ("NASA Modular Model") without nacelles at the NASA Langley 16-Ft Transonic Tunnel. The main objective of the test was to determine the drag reduction achievable with leading-edge and trailing-edge flaps deflected along the outboard wing span at transonic Mach numbers (M = 0.9 to 1.2) for purpose of preliminary design and for comparison with

computational predictions. The obtained drag data with flap deflections for Mach numbers of 1.07 to 1.20 are unique for the Reference H wing. Four leading-edge and two trailing-edge flap deflection angles were tested at a mean-wing chord-Reynolds number of about 5.7 million. An outboard-wing leading-edge flap deflection of 81 provides a 4.5 percent drag reduction at M = 1.2 A = 0.2), and much larger values at lower Mach numbers with larger flap deflections. The present results for the baseline (no flaps deflected) compare reasonably well with previous Boeing and NASA Ref-H tunnel tests, including high-Reynolds number NTF results. Viscous CFD simulations using the OVERFLOW thin-layer N.S. method properly predict the observed trend in drag reduction at M = 1.2 as function of leading-edge flap deflection. Modified linear theory properly predicts the flap effects on drag at subsonic conditions (Aero2S code), and properly predicts the absolute drag for the 40 and 80 leading-edge deflection at M = 1.2 (A389 code).
Author
Performance Tests; Transonic Wind Tunnels; Wind Tunnel Tests; Aerodynamic Configurations; Aircraft Models; Wind Tunnel Models; Leading Edge Flaps; Leading Edges; Trailing Edge Flaps; Nacelles

20000044872 DYNACS Engineering Co., Inc., Renton, WA USA
Assessment of Ref. H HSCT Transonic Flap and Reynolds Number Effects with the OVERFLOW Code
Kandula, Max, DYNACS Engineering Co., Inc., USA; Sheckler, Ross, DYNACS Engineering Co., Inc., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1143-1183; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Transonic flap effects on the aerodynamic performance of Ref. H HSCT wing/body configuration have been analyzed using the OVERFLOW thin-layer Navier-Stokes code. Flap deflection effects at freestream Mach numbers M=0.9 (10/3 deg LE/TE at Re=5.8E6 and 30E6 based on the mean aerodynamic chord, and M=1.2 (10/0 deg and 8/0 deg LE/TE at Re=5.8E6) for a range of angle of attack alpha = 0 to 8 deg are investigated. The predictions from the CFD analysis are correlated with the NTF (M=0.9 at Re=3OE6) and LaRC-16T (M=1.2 at Re=5.8E6) wind tunnel data. Surface grids are generated using Gridgen-2D elliptic grid generator in conjunction with GRIDTOOL for database projection. Volume grids are developed with the HYPGEN hyperbolic grid generator. The volume grid communication is carried out using the PEGSUS code based on Chimera overlapping scheme. Flow solutions are obtained with OVERFLOW code (central-differencing option) with the Baldwin-Barth one-equation turbulence model. Boeing HSCT High Speed Aerodynamics provided the baseline (flaps-up 0/0 deg LE/TE) CFD results and the wind tunnel data presented here. In general the OVERFLOW Navier-Stokes CFD computations correlated well with the NTF and LaRC-16T data for forces, drag polar and pitching moments. The computed drag at low alpha is in general underpredicted, while the computed pitching moment at high alpha deviates appreciably from the data. Calculations for the 10/3 deg flaps at M=0.9 and Re=5.8E6 and 30E6 have indicated that the main effect of Re on the 10/3 deg flaps is seen on the wing upper surface downstream of the the hinge lines. For Re=5.8E6, a separation is noted on the upper surface downstream of the hinge line whereas no separation is observed at higher Reynolds number. The OVERFLOW calculations for the 10/0 deg and the 8/0 deg flaps at M=1.2 correlate well with the LaRC-16T data which show that in the range of alpha = 3 to 8 deg, the 8/0 deg flap performs better than the 10/0 deg flaps relative to the baseline case.
Author
Aerodynamic Characteristics; Airfoil Profiles; Body-Wing Configurations; Aerodynamic Configurations; Aircraft Models; Wind Tunnel Tests; Flow Visualization; Wind Tunnel Models; Performance Prediction; Computational Fluid Dynamics

20000044873 NASA Langley Research Center, Hampton, VA USA
Turbulence Model Comparisons and Reynolds Number Effects Over a High-Speed Aircraft at Transonic Speeds
Rivers, Melissa B., NASA Langley Research Center, USA; Wahls, Richard A., NASA Langley Research Center, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1185-1214; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This paper gives the results of a grid study, a turbulence model study, and a Reynolds number effect study for transonic flows over a high-speed aircraft using the thin-layer, upwind, Navier-Stokes CFL3D code. The four turbulence models evaluated are the algebraic Baldwin-Lomax model with the Degani-Schiff modifications, the one-equation Baldwin-Barth model, the one-equation Spalart-Allmaras model, and Menter's two-equation Shear-Stress-Transport (SST) model. The flow conditions, which correspond to tests performed in the NASA Langley National Transonic Facility (NTF), are a Mach number of 0.90 and a Reynolds number of 30 million based on chord for a range of angle-of-attacks (1 degree to 10 degrees). For the Reynolds number effect study, Reynolds numbers of 10 and 80 million based on chord were also evaluated. Computed forces and surface pressures compare reasonably well with the experimental data for all four of the turbulence models. The Baldwin-Lomax model with the Degani-Schiff modifications and the one-equation Baldwin-Barth model show the best agreement with experiment overall. The Reynolds number effects are evaluated using the Baldwin-Lomax with the Degani-Schiff modifications and the Baldwin-Barth

turbulence models. Five angles-of-attack were evaluated for the Reynolds number effect study at three different Reynolds numbers. More work is needed to determine the ability of CFL3D to accurately predict Reynolds number effects.
Author
Baldwin-Lomax Turbulence Model; Turbulent Flow; Reynolds Number; Transonic Flow; Transonic Wind Tunnels; Computational Fluid Dynamics; Grid Generation (Mathematics); Upwind Schemes (Mathematics); Navier-Stokes Equation; Mathematical Models; Wind Tunnel Models

20000044877 NASA Ames Research Center, Moffett Field, CA USA
Simulated Inlet Unstart and Nacelle/Diverter Effects for the Boeing Reference H Configuration
Cliff, Susan E., NASA Ames Research Center, USA; Baker, Timothy J., Princeton Univ., USA; Thomas, Scott D.; Aguayo, Ernest D.; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1285-1325; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The Boeing Reference H configuration was tested in the NASA Ames 9x7 Supersonic Wind Tunnel. A simulated unstarted inlet was evaluated as well as the aerodynamic performance of the configuration with and without nacelle and diverter components. These experimental results were compared with computational results from the unstructured grid Euler flow solver AIRPLANE. The comparisons between computational and experimental results were good, and demonstrated that the Euler code is capable of efficiently and accurately predicting the changes in the aerodynamic coefficients associated with inlet unstart and the effects of the nacelle and diverter components.
Author
Aerodynamic Configurations; Wind Tunnel Models; Aircraft Models; Supersonic Wind Tunnels; Wind Tunnel Tests; Aerodynamic Characteristics

20000044878 McDonnell-Douglas Aerospace, Long Beach, CA USA
Wing Leading-Edge Geometry Effects on High-Lift Performance
Hoyle, David L., McDonnell-Douglas Aerospace, USA; Hamner, Marvine, McDonnell-Douglas Aerospace, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1327-1343; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The purpose of this study was to gain insight into how wing geometries optimized for high-speed cruise performance performed at low-speed, high-lift conditions. The highly-swept HSR planforms attempt to maximize L/D by using simple-hinged leading-edge flaps to maintain attached flow over the wing during takeoff and landing. Wing leading edge parameters such as leading-edge radius and thickness distribution are typically defined to maximize high-speed cruise performance. This study shows that these parameters also play a crucial role in achieving the high-lift UD's needed to meet minimum noise requirements. Wind tunnel test data recently obtained on an arrow wing configuration yielded a maximum trimmed high-lift UD of only 6.9. The current trimmed high-lift UD metric for this planform is 8.2. Much of the deficiency in L/D was believed to arise from the wing leading edge definition. Wing geometry modifications to both the leading-edge radius and thickness have been analyzed using higher-order CFD methods. It is estimated that implementing these simple changes could increase the high-lift UD's obtained by 1.0 to 1.5. This would correspond to a noise decrease of over 1.5 dB at engine cutback. Additional work needs to be done to determine the trade-offs in wing leading-edge design to maximize both the high-speed cruise and the high-lift performance.
Author
Body-Wing Configurations; Arrow Wings; Leading Edges; Aircraft Design; Aircraft Performance

20000044879 Boeing Commercial Airplane Co., Seattle, WA USA
Impact of Alternate Concepts for Wing Platform, Leading Edge Flaps, and Trim Configuration on the High Lift Performance of the Ref H HSCT
Wyatt, G. H., Boeing Commercial Airplane Co., USA; Visser, K. D., Boeing Commercial Airplane Co., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1345-1373; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This report will cover: 1. High lift aerodynamics overview. 2. The Technology Concept Airplane baseline, its sizing criteria, sensitivity of L/D to noise, and cutback L/D projections for the TCA. 3. A description of the 6% Ref H high lift model and mounting in the 14x22 facility. 4. Results of alternate planform testing, 5. Results of leading edge flap optimization testing, 6. Results of alternate trim concept testing.
Derived from text
Aerodynamics; Aerodynamic Configurations; Canard Configurations; Leading Edge Flaps; Wing Planforms

20000044880 DYNACS Engineering Co., Inc., Renton, WA USA

Assessment of CFD Codes for HSCT Ref. H High Lift Aerodynamics

Saladino, Anthony J., DYNACS Engineering Co., Inc., USA; Sheckler, Ross D., DYNACS Engineering Co., Inc., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1375-1406; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

One of the high lift aerodynamics tasks for 1995 was to assess the applicability of using various CFD codes in predicting wind tunnel data for the Ref. H configuration at high speed and low speed conditions. Both the Euler and the Navier-Stokes methodologies have been utilized and the lift, drag, moment and pressure coefficients have been compared with the NASA Langley 14x22 wind tunnel data, test 404, run 195. The conditions that were tested correspond to a 6% Ref. H wing/body at a Reynolds number of 8.8 million, with flap settings of LE 30 deg/outboard TE 20 deg, Mach number of 0.24 and angle-of-attack of 10 deg. Five CFD codes were chosen for this study: the structured grid codes are CFL3D, TNSMB, INS3D, and OVERFLOW; the unstructured grid code is USM3D. Separate Euler and viscous grids were used in the structured code runs. Two unstructured grids with different hinge line radius, leading and trailing edge detail were developed for the inviscid USM3D code. The wind tunnel data base includes pressure coefficients at seven spanwise cuts and five chordwise cuts, the aerodynamic coefficients C(sub L), C(sub D) and C(sub M), and mini-tuft data. Comparisons between CFD and wind tunnel data will be shown for one spanwise cut (X=2389.75 inches) and two chordwise cuts (Y=286.50 and 481.75 inches), along with comparisons between mini-tuft data and CFD velocity vectors.

Author

Computational Fluid Dynamics; Wind Tunnel Tests; Navier-Stokes Equation; Structured Grids (Mathematics); Unstructured Grids (Mathematics); Grid Generation (Mathematics); Euler Equations of Motion; Body-Wing Configurations

20000045988 NASA Langley Research Center, Hampton, VA USA

1997 NASA High-Speed Research Program Aerodynamic Performance Workshop, Volume 1, Configuration Aerodynamics

Baize, Daniel G., Editor, NASA Langley Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; 802p; In English, 25-28 Feb. 1997, Hampton, VA, USA; See also 20000045989 through 20000046006; Original contains color illustrations

Contract(s)/Grant(s): RTOP 537-07-00

Report No.(s): NASA/CP-1999-209691/VOL1/PT1; L-17916B/VOL1/PT1; NAS 1.55:209691/VOL1/PT1; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

The High-Speed Research Program and NASA Langley Research Center sponsored the NASA High-Speed Research Program Aerodynamic Performance Workshop on February 25-28, 1997. The workshop was designed to bring together NASA and industry High-Speed Civil Transport (HSCT) Aerodynamic Performance technology development participants in areas of Configuration Aerodynamics (transonic and supersonic cruise drag prediction and minimization), High-Lift, Flight Controls, Supersonic Laminar Flow Control, and Sonic Boom Prediction. The workshop objectives were to (1) report the progress and status of HSCT aerodynamic performance technology development; (2) disseminate this technology within the appropriate technical communities; and (3) promote synergy among the scientist and engineers working HSCT aerodynamics. In particular, single- and multi-point optimized HSCT configurations, HSCT high-lift system performance predictions, and HSCT Motion Simulator results were presented along with executive summaries for all the Aerodynamic Performance technology areas.

Author

Aerodynamic Characteristics; Aerodynamic Configurations; Civil Aviation; Supersonic Transports; High Speed

20000045989 McDonnell-Douglas Aerospace, Long Beach, CA USA

Enhancements of CFL3Dhp Parallel Code and Its HSR Applications

Sundaram, Pichuraman, McDonnell-Douglas Aerospace, USA; Novean, Mike, McDonnell-Douglas Aerospace, USA; Cheung, Samson, McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 5-42; In English; See also 20000045988; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This paper presents the recent progress made and the results obtained in the area of parallel computing for the CFD analysis of large HSR configurations. The code used for the present study is CFL3Dhp, a coarse-grain parallel version of the MDC Configuration Aerodynamics group work-horse Euler/Navier-Stokes analysis and nonlinear design code, CFL3D. The original parallelization of the code was carded out by Computer Sciences Corporation under contract from NASA LaRC. The parallel version of the code uses MPI as the message passing language and can be used'in a heterogeneous distributed computing environment. Several enhancements to the code have been made at MDC including the addition of a full restart capability as well as making

it more user friendly. The successful application of the code on a parallel platform, the IBM SP-2 system for several HSCT configurations are demonstrated. Also, the application of the code on other shared memory platforms such as Cray Q-90 and the J-90 cluster are also highlighted. The results obtained show the promise of using this code for large CFD problems in HSCT analysis and design with rapid turn-around.
Author
Computational Fluid Dynamics; Parallel Processing (Computers); Supersonic Transports; Aerodynamic Configurations; Applications Programs (Computers)

20000045992 McDonnell-Douglas Corp., Long Beach, CA USA
Improvements to the MDC Nonlinear Aerodynamic Design Tools
Hager, James O., McDonnell-Douglas Corp., USA; Hartwich, Peter M., McDonnell-Douglas Corp., USA; Unger, Eric R., McDonnell-Douglas Corp., USA; Kuruvila, Geojoe, McDonnell-Douglas Corp., USA; Narducci, Robert P., McDonnell-Douglas Corp., USA; Agrawal, Shreekant, McDonnell-Douglas Corp., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 189-254; In English; See also 20000045988; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

Nonlinear aerodynamic optimization is considered a key technology required to develop a High Speed Civil Transport (HSCT). Within the High Speed Research (HSR) program, McDonnell Douglas is developing nonlinear optimization tools to be able to support the launch of an HSCT program at the end of HSR II. This paper presents recent improvements to the tools. The first set of improvements were made to be able to optimize the Technology Concept Aircraft (TCA). The TCA presented some grid generation issues because it is a true low-wing configuration. In addition, several constraints were required to maintain a realistic design. Second, the geometry modeling capability was improved to move toward full-configuration modeling. Empennage effects have been modeled, and wing/body/flaps configurations can be modeled. Efforts were also made to produce and improve tools required for integrated wing/body/nacelle/ diverter modeling. Third, alternate gradient evaluation techniques are being examined to replace the finite-difference'calculations currently being used. ADIFOR was applied to CFL3D and demonstrated for a 100+ design-variable problem. Also, an. adjoint module is being created for TLNS3D. Finally, a transition is being made to a modular design environment to facilitate improvements and the addition of new codes.
Author
Aerodynamic Configurations; Civil Aviation; Design Analysis; Nonlinearity; Supersonic Transports; Optimization

20000045994 McDonnell-Douglas Aerospace, Long Beach, CA USA
Isolated and Installed Nozzle Boattail Drag Studies
Wallace, Hoyt, McDonnell-Douglas Aerospace, USA; Sundaram, Pichuraman, McDonnell-Douglas Aerospace, USA; Arslan, Alan E., McDonnell-Douglas Aerospace, USA; Shieh, Chih-Fang, McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 305-374; In English; See also 20000045988; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

As part of the FY95 transonic nozzle boattail drag study for the Reference H configuration, the McDonnell Douglas (MDC) task included the axisymmetric nozzle assessment while Northrop Grumman (NGC) studied the 2-D nozzle geometry. The 2-D nozzle was a simulation of the baseline nozzle as of March 1995, while the axisymmetric nozzle was the equivalent body of revolution. Boattail settings representing transonic operation (i.e., small exit area) and the wideopen, supersonic reference nozzle were analyzed. During the course of the investigation, significant difficulties were experienced and hence the results of the axisymmetric supersonic nozzle geometry could not be obtained. As a result, the study was continued (although with minimal effort) this past year to complete the axisymmetric nozzle geometry. A new grid was generated with a modified topology, first for the installed axisymmetric supersonic nozzle configuration and later for the axisymmetric transonic nozzle (solution repeated for consistency) configuration. After successfully obtaining the CFL3D Navier-Stokes results for the axisymmetric installed nozzle geometry at M (sub infinity) = 0.9, the study was continued for the 2-D installed transonic nozzle configuration as well, to ensure consistency in the comparison of the axisymmetric and 2-D nozzle results. Solutions for the four isolated nacelles have been obtained at both Mach 0.9 and 1.10. The solutions for the installed axisymmetric supersonic nozzle configuration at Mach 1.10 and for the 2-D installed transonic nozzle configuration at either Mach 0.9 or Mach 1.10 have not been obtained as of this writing. However, the results to date indicated the following: (1) the drag of the isolated axisymmetric transonic nozzle was slightly less that that of the 2-D nozzle at both Mach 0.9 and 1.10; (2) the interference drag for both the axisymmetric and 2-D nacelles are nearly identical at Mach 0.90.
Author
Boattails; Two Dimensional Flow; Transonic Nozzles; Civil Aviation; Computational Fluid Dynamics; Aerodynamic Drag; Nozzle Geometry; Wind Tunnel Tests

20000046001 NASA Langley Research Center, Hampton, VA USA

Prediction and Assessment of Reynolds Number Sensitivities Associated with Wing Leading-Edge Radius Variations

Wahls, Richard A., NASA Langley Research Center, USA; Rivers, Melissa B., NASA Langley Research Center, USA; Owen, Lewis R., Jr., NASA Langley Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 588-610; In English; See also 20000045988; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The primary objectives of this study were to expand the data base showing the effects of LE radius distribution and corresponding . sensitivity to Rn at subsonic and transonic conditions, and to assess the predictive capability of CFD for these effects. Several key elements led to the initiation of this project: 1) the necessity of meeting multipoint design requirements to enable a viable HSCT, 2) the demonstration that blunt supersonic leading-edges can be associated with performance gain at supersonic speeds , and 3) limited data. A test of a modified Reference H model with the TCA planform and 2 LE radius distributions was performed in the NTF, in addition to Navier-Stokes analysis for an additional 3 LE radius distributions. Results indicate that there is a tremendous potential to improve high-lift performance through the use of a blunt LE across the span given an integrated, fully optimized design, and that low Rn data alone is probably not sufficient to demonstrate the benefit.

Author

Prediction Analysis Techniques; Radii; Reynolds Number; Sensitivity; Computational Fluid Dynamics; Supersonic Transports; Leading Edge Flaps

20000046002 NASA Langley Research Center, Hampton, VA USA

Preliminary Results of the 1.5% TCA (Modular) Controls Model in the NASA Langley UPWT

Kubiatko, Paul, McDonnell-Douglas Aerospace, USA; McMillin, Naomi, NASA Langley Research Center, USA; Cameron, Douglas C., McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 612-668; In English; See also 20000045988; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

To summarize the significant highlights in this report: (1) Data quality, determined by multiple repeat runs performed on the TCA baseline configuration, and long-term repeatability, determined by comparing baseline Reference H data from this test to a previous test, have been shown to be good. (2) The longitudinal stability of the TCA is more non-linear than for the Reference H, and while it is similar at normal lift values, the TCA has considerably more pitch-up at higher lift. (3) Longitudinal control effectiveness of the TCA is similar to the Reference H and the ratio of elevator effectiveness to horizontal tail effectiveness is approximately 0.3. 4) The directional stability of the TCA is improved relative to Reference H at higher angles-of attack. The chine is effective for improving directional stability. (5) The directional control effectiveness ’of the TCA rudder is the same as that of the Reference H rudder at low angles-of-attack, after taking factors, such as number of rudder panels deflected and vertical tail volume into account. However, rudder effectiveness was shown to be reduced at higher angles-of-attack. (6) The lateral stability was shown to be reduced relative to the Reference H, which may be beneficial at low speeds for alleviating lateral control saturation. (7) Lateral control effectiveness for the TCA was shown to be similar to the Reference H for negative trailing-edge flap deflections and was reduced by approximately 25% for positive trailing-edge flap deflections.

Derived from text

Wind Tunnel Tests; Civil Aviation; Controllability; Aircraft Models; Aerodynamic Characteristics

20000046003 NASA Langley Research Center, Hampton, VA USA

Effect of Boattail and Sidewall Curvature on Nozzle Drag Characteristics

Capone, Francis J., NASA Langley Research Center, USA; Deere, Karen A., NASA Langley Research Center, USA; Bangert, Linda S., NASA Langley Research Center, USA; Pao, Paul S., NASA Langley Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 669-706; In English; See also 20000045988; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The NASA-industry team has sponsored several studies in the last two years to address the installed nozzle boattail drag issues. Some early studies suggested that nozzle boattail drag could be as much as 25 to 40 percent of the subsonic cruise. As part of this study tests have been conducted at NASA-Langley to determine the uninstalled drag characteristics of a proposed nozzle. The overall objective was to determine the effects of nozzle external flap curvature and sidewall boattail variations. This test would also provide data for validating CFD predictions of nozzle boattail drag.

Derived from text

Boattails; Curvature; Nozzle Geometry; Aerodynamic Drag; Computational Fluid Dynamics; Supersonic Speed

20000046004 Boeing Co., Boeing Commercial Airplane Group, Seattle, WA USA

Development of TCA Flight Drag Polars for Airplane Performance

Nelson, Chester P., Boeing Co., USA; Adamson, Eric E., Boeing Co., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 707-727; In English; See also 20000045988; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

In early 1996 the NASA-industry High Speed Research Technical Integration team released the final definition of the HSCT Technology Concept Airplane (TCA). This configuration represents the integration of current inputs from all technical disciplines into a realistic High Speed Civil Transport concept. This paper reviews the development and content of the high speed aerodynamics inputs to the TCA sizing and flight performance predictions. The paper also summarizes subsequent detailed analysis work, CFD, and TCA wind tunnel test data that are now being used to assess the drag levels of the ”status” airplane (i.e. without projections). A bottoms-up assessment of the high speed drag technology projection is shown to identify reasonable sources of drag improvements that would meet the target levels. Sources of uncertainty in the current HSCT high speed drag predictions are outlined, and areas for risk reduction in future performance predictions are identified.

Author

Aerodynamic Drag; Aircraft Performance; Civil Aviation; Computational Fluid Dynamics; Supersonic Transports; Wind Tunnel Tests

20000046006 McDonnell-Douglas Corp., Long Beach, CA USA

Overview of MDC Configurations Aerodynamics Activities

Agrawal, Shreekant, McDonnell-Douglas Corp., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 1-4; In English; See also 20000045988; No Copyright; Avail: CASI; A01, Hardcopy; A10, Microfiche

This paper presents an outline of a general overview of MDC (McDonnell Douglas Corporation) Configuration Aerodynamics Activities in outline form. The topics are: 1) Nonlinear Rigid and Aeroelastic Analysis Methods; 2) Aerodynamic Design Optimization Capability; 3) Nacelle/Diverter Design and Airframe Integration; and 4) Technology Concept Assessment.

CASI

Aerodynamic Configurations; Aerodynamics; General Overviews

20000048284 Defence Science and Technology Organisation, Salisbury Australia

A Correlation Between Flight- Determined Longitudinal Derivatives and Ground-based Data for the Pilatus PC 9/A Training Aircraft in Cruise Configuration

Snowden, Andrew D.; Keating, Hilary A.; van Bronswijk, Nick; Drobik, Jan S.; Feb. 2000; 45p; In English

Report No.(s): AD-A376020; DSTO-TR-0937; DODA-AR-011-205; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of flight tests were conducted on the PC 9/A aircraft, A23-045 at the Royal Australian Air Force’s Aircraft Research and Development Unit System identification techniques were applied to the data obtained from these flight tests to determine the stability and control derivatives of the aircraft. The longitudinal results for the aircraft in cruise configuration are presented in this report and comparisons are made with empirical and ground based estimates.

DTIC

System Identification; Derivation

20000048287 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Comparison of AEDC 4T and CALSPAN 8-ft Wing Tunnels for FA-18C/JDAM

Ray, E.; Jan. 13, 2000; 11p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA

Report No.(s): AD-A376031; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flight test results for MK-84 Joint Direct Attack Munition (JDAM) separation from an F/A-18C allow for direct comparison between the Arnold Engineering Development Center 4 ft X 4 ft and CALSPAN 8 ft X 8 ft transonic wind tunnel data. Both free-stream and Captive Trajectory System flow-field grid surveys were compared. Wind tunnel data tended to agree relatively well between wind tunnels. Wind tunnel data were input into the Navy Generalized Separation Package store separation simulation software. Comparisons were made between the flight paths derived from both wind tunnels to actual flight test data. Trajectory data were then used to calculate minimum miss distances between the JDAM and F-18. While it was expected that data from the

larger tunnel would result in simulations closer to flight testing, both data sets resulted in similar results. Most differences can be attributed to Mach number sensitivity.
DTIC
Wind Tunnel Tests; Product Development

20000048733 NASA Langley Research Center, Hampton, VA USA
1997 NASA High-Speed Research Program Aerodynamic Performance Workshop, Volume 2, High Lift
Baize, Daniel G., Editor, NASA Langley Research Center, USA; December 1999; 796p; In English; Aerodynamic Performance, 25-28 Feb. 1997, Hampton, VA, USA; See also 20000048734 through 20000048753
Contract(s)/Grant(s): RTOP 537-07-00
Report No.(s): NASA/CP-1999-209691/VOL2; L-17916D/VOL2; NAS 1.55:209691/VOL2; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

The High-Speed Research Program and NASA Langley Research Center sponsored the NASA High-Speed Research Program Aerodynamic Performance Workshop on February 25-28, 1997. The workshop was designed to bring together NASA and industry High-Speed Civil Transport (HSCT) Aerodynamic Performance technology development participants in areas of Configuration Aerodynamics (transonic and supersonic cruise drag, prediction and minimization), High-Lift, Flight Controls, Supersonic Laminar Flow Control, and Sonic Boom Prediction. The workshop objectives were to (1) report the progress and status of HSCT aerodynamic performance technology development; (2) disseminate this technology within the appropriate technical communities; and (3) promote synergy among the scientist and engineers working HSCT aerodynamics. In particular, single- and multi-point optimized HSCT configurations, HSCT high-lift system performance predictions, and HSCT Motion Simulator results were presented along with executives summaries for all the Aerodynamic Performance technology areas.
Author
Aerodynamic Characteristics; Aerodynamic Configurations; Civil Aviation; Performance Prediction; Supersonic Transports; Technology Utilization

20000048734 NASA Langley Research Center, Hampton, VA USA
HSR High Lift Program and PCD2 Update
Kemmerly, Guy T., NASA Langley Research Center, USA; Coen, Peter, NASA Langley Research Center, USA; Meredith, Paul, Boeing Commercial Airplane Co., USA; Clark, Roger, McDonnell-Douglas Aerospace, USA; Hahne, Dave, NASA Langley Research Center, USA; Smith, Brian, NASA Ames Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 1693-1705; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The mission of High-Lift Technology is to develop technology allowing the design of practical high lift concepts for the High-Speed Civil Transport (HSCT) in order to: 1) operate safely and efficiently; and 2) reduce terminal control area and community noise. In fulfilling this mission, close and continuous coordination will be maintained with other High-Speed Research (HSR) technology elements in order to support optimization of the overall airplane (rather than just the high lift system).
Derived from text
Civil Aviation; Supersonic Transports; Lift; Wind Tunnel Tests; Computational Fluid Dynamics; Control Stability

20000048735 Boeing Commercial Airplane Co., Seattle, WA USA
Prediction of TCA Full Scale High Lift Characteristics
Meredith, Paul T., Boeing Commercial Airplane Co., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 1707-1749; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The projected TCA L/D is reasonable but risky. TCA (Technology Concept Airplane) does not meet touchdown attitude requirements for a 155kt approach speed. L/D improvements may not show up as MTOW (Maximum Takeoff Weight) reductions since the TCA is sized with projected L/D. The status will approach the projection, risk & uncertainty will decrease, and the technology readiness level (TRL) will increase. Common High lift Process is mostly defined but not implemented.
Derived from text
Aerodynamic Characteristics; Full Scale Tests; Lift; Performance Prediction; Civil Aviation; Supersonic Transports

20000048736 NASA Langley Research Center, Hampton, VA USA

Use of Boundary Layer Transition Detection to Validate Full-Scale Flight Performance Predictions

Hamner, Marvine, McDonnell-Douglas Aerospace, USA; Owens, L. R., Jr., NASA Langley Research Center, USA; Wahls, R. A., NASA Langley Research Center, USA; Yeh, David, McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 1751-1772; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Full-scale flight performance predictions can be made using CFD or a combination of CFD and analytical skin-friction predictions. However, no matter what method is used to obtain full-scale flight performance predictions knowledge of the boundary layer state is critical. The implementation of CFD codes solving the Navier-Stokes equations to obtain these predictions is still a time consuming, expensive process. In addition, to ultimately obtain accurate performance predictions the transition location must be fixed in the CFD model. An example, using the M2.4-7A geometry, of the change in Navier-Stokes solution with changes in transition and in turbulence model will be shown. Oil flow visualization using the M2.4-7A 4.0% scale model in the 14'x22' wind tunnel shows that fixing transition at 10% x/c in the CFD model best captures the flow physics of the wing flow field. A less costly method of obtaining full-scale performance predictions is the use of non-linear Euler codes or linear CFD codes, such as panel methods, combined with analytical skin-friction predictions. Again, knowledge of the boundary layer state is critical to the accurate determination of full-scale flight performance. Boundary layer transition detection has been performed at 0.3 and 0.9 Mach numbers over an extensive Reynolds number range using the 2.2% scale Reference H model in the NTF. A temperature sensitive paint system was used to determine the boundary layer state for these conditions. Data was obtained for three configurations: the baseline, undeflected flaps configuration; the transonic cruise configuration; and, the high-lift configuration. It was determined that at low Reynolds number conditions, in the 8 to 10 million Reynolds number range, the baseline configuration has extensive regions of laminar flow, in fact significantly more than analytical skin-friction methods predict. This configuration is fully turbulent at about 30 million Reynolds number for both 0.3 and 0.9, Mach numbers. Both the transonic cruise and the high-lift configurations were fully turbulent aft of the leading-edge flap hingeline at all Reynolds numbers.

Derived from text

Boundary Layer Transition; Computational Fluid Dynamics; Flight Characteristics; Performance Prediction; Wind Tunnel Models; Full Scale Tests

20000048737 ASE Technologies, Inc., Cincinnati, OH USA

Application of CFL3D to Aerodynamic Analysis of HSCT High Lift Wing/Body/Nacelle Configurations

Fan, Xue-Tong, ASE Technologies, Inc., USA; Hickey, Paul, ASE Technologies, Inc., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 1849-1882; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The first objective is to develop effective modeling procedures for CFD analysis of HSCT High Lift Wing/Body/Nacelle (WBN) configurations, develop multi-zone grid structure to include nacelle installation with and without deflected trailing edge flaps, and apply CFL3D to these complex wing/body/nacelle configurations using RONNIE preprocessor for block interfacing. The second is to evaluate the effect of nacelle installation on the aerodynamic performance of HSCT High Lift configurations, identify and analyze important flow characteristics due to nacelle installation to support Propulsion Airframe Integration, and to provide flow and performance data to supplement wind tunnel tests.

Derived from text

Aerodynamic Characteristics; Aerodynamic Configurations; Computational Fluid Dynamics; Wind Tunnel Tests; Nacelles; Applications Programs (Computers); Supersonic Transports; Body-Wing Configurations

20000048738 Boeing North American, Inc., Seal Beach, CA USA

CLF3D/MAGGIE CFD Analysis of a 4%-Scale HSCT Aircraft Model Inside a 12-ft Wind Tunnel

Woan, Chung-Jin, Boeing North American, Inc., USA; Yeh, David T., McDonnell-Douglas Aerospace, USA; Clark, Roger W., McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 1883-1931; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The objectives of this study are: 1) to develop an integrated wind-tunnel/free-air CFD process to speed up CFD turnaround time in HSCT high-lift configuration development through a direct CFD application to the M2.4-7A Arrow Wing configuration at low speed; 2) to study the effects of wind-tunnel wall on the model aerodynamic characteristics and the combined effects due to the wind4unnel wall and model supports through direct comparison of CFD calculations; and 3) to obtain CFD results prior to wind-tunnel tests and to validate and evaluate the CFD results by direct comparison with wind-tunnel test data. Currently,

M2.4-7A is still under schedule to be wind-tunnel tested in the NASA/Ames 12-ft tunnel. Therefore, the validation of CFD results against test data will not be included in this paper.
Derived from text
Aerodynamic Characteristics; Aerodynamic Configurations; Aircraft Models; Computational Fluid Dynamics; Wind Tunnel Tests; Wind Tunnel Walls; Preprocessing

20000048739 NASA Langley Research Center, Hampton, VA USA
Results of a WINGDES2/AERO2S Flap Optimization for the TCA
Yaros, Steven F., NASA Langley Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 1933-1946; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The codes WINGDES2 and AERO2S were easy to obtain, and technical help was readily available. The codes have a long, well-documented history of successful optimizations of various aircraft configurations. The codes were easy to use, although specification of input data was time-consuming. The Run times were short, allowing the many runs necessary for the Suction Parameter matrix to be accomplished within a day or two. The results of the optimization appear to be reasonable.
Derived from text
Optimization; Flaps (Control Surfaces); Aircraft Configurations; Applications Programs (Computers); Civil Aviation

20000048740 Vigyan Research Associates, Inc., Hampton, VA USA
Flow Simulation About a High-Lift High Speed Civil Transport Using TetrUSS
Lessard, Victor, Vigyan Research Associates, Inc., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 1947-1974; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

TetrUSS unstructured grid generation for both Euler and viscous calculations of high-lift HSR configurations is both fast and straight forward. The flap effectiveness study shows the potential of using unstructured Euler calculations as a part of the preliminary design process. USM3D viscous calculations on the baseline TCA configuration compared well with the limited experimental data. USM3D has the potential of handling complex viscous flow fields.
Derived from text
Civil Aviation; Supersonic Transports; Viscous Flow; Computerized Simulation; Aerodynamic Configurations; Applications Programs (Computers); Lift

20000048741 NASA Langley Research Center, Hampton, VA USA
A CFD Assessment of Several High-Lift Reference H Configuration Using Structured Grids
Lessard, Wendy B., NASA Langley Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 1975-2001; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The objective of this study is to calibrate a Navier-Stokes code for a high-lift Reference H configuration using structured grids. The outline of this presentation will first include a brief description of the grids used and the flow solver. Next the results will be presented in terms of convergence and resources used on the C-90. Predicted force and moment and surface pressure results are compared to experiment and off- and on-surface flow viz. is discussed.
Derived from text
Computational Fluid Dynamics; Structured Grids (Mathematics); Lift; Navier-Stokes Equation; Nacelles; Body-Wing and Tail Configurations

20000048742 Boeing Commercial Airplane Co., Seattle, WA USA
Assessment and Application of CFD Methods for HSCT High-Lift Aerodynamics
Chen, Allen, Boeing Commercial Airplane Co., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 2003-2075; In English; See also 20000048733; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

This paper presents an Assessment and Application of CFD Methods For HSCT High-Lift Aerodynamics. The topics discussed are: 1) Review of CFD (Computational Fluid Dynamics Codes; 2) Overview of CFD Activities; 3) The Process; 4) Results; and 5) Issues. This paper is presented in viewgraph form.
CASI
Civil Aviation; Computational Fluid Dynamics; Supersonic Transports; Lift; Applications Programs (Computers)

20000048743 Boeing Commercial Airplane Co., Seattle, WA USA

Recent High Lift Systems and Alternate Control Test Results

Wyatt, G. H., Boeing Commercial Airplane Co., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 2077-2104; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

High lift performance continues to be critical to the HSR program. Currently the baseline TCA is sized to Stage III -3db at cutback. A more aggressive noise goal of Stage III -5db will make achieving the technology projection for L/D at cutback more critical. Lift at takeoff and touchdown will be reduced when the new common process is finished. The use of wind tunnel data instead of AERO2S will reduce lift levels. This will also make the TOFL and VAPP constraints more critical. As the literature suggests dynamic ground effect may be as little as 1/2 of static ground effect. We currently are using static ground effect. If dynamic ground effect considerations are required, then lift will be even more critical to mission sizing. High lift systems on canards will need to be worked harder to get the desired lift with minimum drag. The simple attempt to improve the high AR canard with dowels and clax did not work. We have to do our homework in this area to produce an efficient highly loaded canard. The basic wing produces lots of induced drag with lift, by reducing wing lift and carrying the lift reduction from the wing on a high AR canard with better induced drag characteristics leads to a more efficient system. A high mount canard may provide up to 0.5 units improvement in trimmed L/D, this benefit seems to diminish as the canard is mounted longitudinally closer to the wing.
Derived from text

Lift; Canard Configurations; Wind Tunnel Tests; Longitudinal Control; Helicopter Performance

20000048744 Lockheed Martin Aeronautical Systems, Marietta, GA USA

An Approach to Modeling HSR Configurations With Control Surface Deflections

Kinard, Tom, Lockheed Martin Aeronautical Systems, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 2105-2153; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The overall objective of this work is to evaluate state-of-the-art CFD methods for application to high speed research configurations. The tools will be evaluated as to their ability to produce good flow field predictions for use in preliminary and detailed design studies. The current focus of the work is on high lift configurations of the Reference H aircraft. Particular attention is placed on the ability of structured grid methods to predict the flow field around wings with deflected flaps. The objective of the first study presented here is to assess the ability of the CFL3D code to predict the forces and moments due to multiple trailing edge flap deflections. The objective of the second or ground effect study is to evaluate the current state-of-the-art in predicting aerodynamic characteristics of a HSR configuration operating in close proximity of the ground. An exhaustive examination of this topic is beyond the scope of current funding, therefore a limited study involving only a few configurations has been undertaken.
Derived from text

Control Surfaces; Deflection; Supersonic Transports; Aerodynamic Configurations; Computational Fluid Dynamics; Scale Models; Aerodynamic Characteristics

20000048745 McDonnell-Douglas Aerospace, Long Beach, CA USA

Automated Flap Deflection Procedures for HSCT High-Lift Aerodynamics

Yeh, David T., McDonnell-Douglas Aerospace, USA; Clark, Roger W., McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 2155-2229; In English; See also 20000048733; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

This report starts with the statement of the objective for the HSCT high-lift aerodynamics, followed by the description of the need for automatic flap modeling procedures for high-lift applications. The flap layout and arrangement for HSCT high-lift configurations are described. The detailed methodologies and gridding techniques incorporated in the flap deflection procedures are discussed. The numerical capability of the flap procedures is demonstrated for a number of HSCT high-lift configurations. Sample solutions and code validation are presented followed by a summary.
Derived from text

Aerodynamic Configurations; Civil Aviation; Deflection; Flapping; Supersonic Transports; Lift

20000048746 Boeing Co., Seattle, WA USA

A New Approach to Constrained Induced and Trim Drag Optimization

Feifel, Winifried M., Boeing Co., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 2231-2256; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

A new numerical method has been developed which allows the easy construction of a complete induced drag and pitch trim model for fully three-dimensional aircraft configurations comprised of an arbitrary number of lifting surfaces. The induced drag is described as a function of a small number of parameters, such as lift, canard, wing, and tail incidence angles, and the deflection angles of trailing edge flaps. Combined with constrained optimization the method allows optimal trim of multi-surface configurations with minimum computational effort on a PC. Ref.H tmfling edge flap positions have been experimentally optimized -tail off- as part of the NASA437 test series conducted in the NASA Langley 14x22 wind tunnel. Generally, the untrimmed 'optimum' configurations exhibited large pitching moments. The above described method accepts experimentally acquired data as constraints and thus can be used to determine trimmed model performance characteristics. The analyses indicate that the trimmed optimum performance greatly depends on the type of trim surfaces used. At the lift coefficients of interest a canard configuration exhibits DELTAL/D=0.7 higher lift/drag ratio than the conventional tail configuration. Only about 1/3 of the canard performance gain is shown to be the result of savings in induced drag. The balance of the gain is attributed to changes in wing viscous drag. Compared to the conventional tail configuration the performance of the canard is shown to be less sensitive to migration of the airplane center of gravity. Only small further performance improvements seem to become available from a tri-surface configuration.

Derived from text

Aerodynamic Balance; Aircraft Configurations; Induced Drag; Optimization; Wind Tunnel Tests; Applications Programs (Computers); Three Dimensional Models; Computational Fluid Dynamics

20000048747 NASA Ames Research Center, Moffett Field, CA USA

High-Lift Engine Aeroacoustics Technology (HEAT) Test Program Overview

Zuniga, Fanny A., NASA Ames Research Center, USA; Smith, Brian E., NASA Ames Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 2257-2276; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The NASA High-Speed Research program developed the High-Lift Engine Aeroacoustics Technology (HEAT) program to demonstrate satisfactory interaction between the jet noise suppressor and high-lift system of a High-Speed Civil Transport (HSCT) configuration at takeoff, climb, approach and landing conditions. One scheme for reducing jet exhaust noise generated by an HSCT is the use of a mixer-ejector system which would entrain large quantities of ambient air into the nozzle exhaust flow through secondary inlets in order to cool and slow the jet exhaust before it exits the nozzle. The effectiveness of such a noise suppression device must be evaluated in the presence of an HSCT wing high-lift system before definitive assessments can be made concerning its acoustic performance. In addition, these noise suppressors must provide the required acoustic attenuation while not degrading the thrust efficiency of the propulsion system or the aerodynamic performance of the high-lift devices on the wing. Therefore, the main objective of the HEAT program is to demonstrate these technologies and understand their interactions on a large-scale HSCT model. The HEAT program is a collaborative effort between NASA-Ames, Boeing Commercial Airplane Group, Douglas Aircraft Corp., Lockheed-Georgia, General Electric and NASA - Lewis. The suppressor nozzles used in the tests were Generation 1 2-D mixer-ejector nozzles made by General Electric. The model used was a 13.5%-scale semi-span model of a Boeing Reference H configuration.

Derived from text

Aeroacoustics; Civil Aviation; Engine Tests; Supersonic Transports; Wind Tunnel Tests; Lift; Nozzle Geometry; Scale Models

20000048748 DYNACS Engineering Co., Inc., Renton, WA USA

Numerical Study of the Reynolds Number Effect and Boundary Layer Transition Location Effect

Saladino, Anthony J., DYNACS Engineering Co., Inc., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 2277-2354; In English; See also 20000048733; No Copyright; Avail: CASI; A05, Hardcopy; A10, Microfiche

This presentation summarizes the effects of Reynolds number and boundary layer transition between wind tunnel data and CFD solutions. Computations for a Ref. H wing/body configuration with flaps deflected LE 30 degrees/outboard TE 20 degrees were analyzed for two Reynolds numbers and one trip location. This study will focus on a single Mach number, angle of attack and flap setting to assess the predictive capabilities of CFD. Results are shown for Mach 0.3 and alpha 10 degrees. The first part of this study evaluated the TNS3DMB CFD code for capturing the influence of Reynolds number variations. Wind tunnel measurements were made in the NTF at chord Reynolds numbers of 30 million and 90 million. Pressure data from NTF test 057 at various spanwise and chordwise stations are compared with CFD; aerodynamic coefficient data from NTF test 060 are compared with CFD. Based upon the results from the Reynolds number study, it was concluded that there was a need to understand the influence of boundary layer transition effects on the aerodynamic coefficients. Data from NTF test 080 was used to compare with TNS3DMB at a chord Reynolds number of 21.6 million. Comparisons were made with NTF tests without and with trips, and with

CFD runs at fully turbulent conditions and with the wing tripped at the leading edge hinge line. Additional results obtained from CFD include surface plots of pressure coefficient, Y (exp +), C (sub f), and velocity vectors.
Derived from text
Boundary Layer Transition; Computational Fluid Dynamics; Reynolds Number; Wind Tunnel Tests; Flapping; Body-Wing Configurations

20000048749 NASA Langley Research Center, Hampton, VA USA
Testing the 2.2% HSR Reference H Model with a Modified Wing Planform in the NTF
Owens, Lewis R., Jr., NASA Langley Research Center, USA; Wahls, Richard A., NASA Langley Research Center, USA; Hamner, Marvine P., McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 2355-2384; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The HSR program moved into phase two with the selection of a new airplane configuration, the Technology Concept Airplane (TCA). The TCA was designed based on the experiences gained while investigating both the Reference H and the Arrow Wing configurations in different wind tunnels and CFD studies. Part of that investigation included performing extensive high Reynolds number testing on the Reference H configuration in the NTF to provide data for predicting full-scale flight performance, as well as developing techniques for testing these types of configurations in the NTF. With the selection of the TCA configuration, a smaller investigation was designed to examine whether or not the scaling characteristics of the TCA configuration are similar to those observed for the Reference H configuration. This presentation will include a description of the 2.2% Modified Reference H model used in this investigation (highlighting the similarities and the differences when compared to the TCA configuration), the testing objectives, and some preliminary findings that are relevant to the current high-lift system.
Derived from text
Aerodynamic Configurations; Computational Fluid Dynamics; Wing Planforms; Wind Tunnel Tests; Test Facilities

20000048751 Boeing Commercial Airplane Co., Seattle, WA USA
Status of NASA No. 442 Test Results: 6% Ref. H Upflow and Interference Test in the LaRC 14-ft x 22-ft
Griffiths, Robert C., Boeing Commercial Airplane Co., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 2409-2429; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The purpose of this Test #442 was to test Ref. H model configurations in such a manner that 14’x22’ upflow and post mount support interference could be determined. Comparisons of experimentally derived interference data will be compared to computationally calculated support interference. The results of this test will support an HSR contract deliverable.
Derived from text
Wind Tunnel Tests; Flow Visualization; Support Interference; Aerodynamic Configurations; Subsonic Wind Tunnels

20000048752 McDonnell-Douglas Aerospace, Long Beach, CA USA
Application of a 3-D Panel Method to the Prediction of Wind Tunnel Wall and Support Interference
Polito, Ryan C., McDonnell-Douglas Aerospace, USA; Powell, Arthur G., McDonnell-Douglas Aerospace, USA; Clark, Roger W., McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 2431-2459; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The objective of this study is to evaluate the prediction of wind tunnel wall and support effects using a 3-D panel method. The results presented here are based on the 6% Ref H model installed in the NASA LaRC 14’x22’ wind tunnel. However, the modeling developed will be used for the correction of data to be obtained for the TCA configuration in both the LARC 14’x22’ tunnel as well as in the ARC 12’ Pressure Tunnel. Since the data from the 6% Ref H test has only recently been released, this effort is still in progress. The results presented here are therefore regarded as preliminary.
Derived from text
Aerodynamic Interference; Panel Method (Fluid Dynamics); Wind Tunnel Walls; Wind Tunnel Tests; Three Dimensional Flow; Aerodynamic Configurations; Performance Prediction

20000048753 McDonnell-Douglas Aerospace, Long Beach, CA USA

Assessment of Computational Methods Applied to HSCT High-Lift Configurations with Multiple Flap Surfaces

Yeh, David, McDonnell-Douglas Aerospace, USA; Clark, Roger W., McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 1773-1847; In English; See also 20000048733; No Copyright; Avail: CASI; A05, Hardcopy; A10, Microfiche

This report starts with the description of the objective for the HSCT high-lift aerodynamics, followed by the numerical approach. The automated flap deflection procedures used for high-lift applications will be briefly described. The numerical results for the high-lift configurations will be presented including code validation, predicted flow physics as well as the discussion of the numerical issues that affect the flow solutions. This report concludes with a summary and future plans.

Derived from text

Aerodynamic Configurations; Civil Aviation; Supersonic Transports; Lift; Computational Fluid Dynamics; Technology Assessment; Flaps (Control Surfaces)

20000050476 Army Research Lab., Hampton, VA USA

Contributions of the Langley Transonic Dynamics Tunnel to Rotorcraft Technology and Development

Yeager, William T., Jr., Army Research Lab., USA; Kvaternik, Raymond G., NASA Langley Research Center, USA; [2000]; 60p; In English; Dynamics Specialists Conference, 5-6 Apr. 2000, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-1771; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A historical account of the contributions of the Langley Transonic Dynamics Tunnel (TDT) to rotorcraft technology and development tunnel's inception in 1960 is presented. The paper begins with a summary of the major characteristics of the TDT and a description of the unique capability offered by the TDT for testing aeroelastic models by virtue of its heavy gas test medium. This is followed by some remarks on the role played by scale models in the design and development of rotorcraft vehicles and review of the basic scaling relationships important for designing and building dynamic aeroelastic models of rotorcraft vehicles for testing in the TDT. Chronological accounts of helicopter and tiltrotor research conducted in the TDT are then described in separate sections. The discussions include a description of the various models employed, the specific objectives of the tests, and illustrative results.

Author

Rotary Wing Aircraft; Transonic Wind Tunnels; Scale Models; Aeroelasticity; Turbofan Engines; Histories

20000052206 NASA Dryden Flight Research Center, Edwards, CA USA

Longitudinal Handling Qualities of the TU-144LL Airplane and Comparisons With Other Large, Supersonic Aircraft

Cox, Timothy H., NASA Dryden Flight Research Center, USA; Marshall, Alisa, NASA Dryden Flight Research Center, USA; May 2000; 44p; In English

Contract(s)/Grant(s): RTOP 529-50-24-E8-RC

Report No.(s): NASA/TM-2000-209020; H-2401; NAS 1.15:209020; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Four flights have been conducted using the TU-144LL supersonic transport aircraft with the dedicated objective of collecting quantitative data and qualitative pilot comments. These data are compared with the following longitudinal flying qualities criteria: Neal-Smith, short-period damping, time delay, control anticipation parameter, phase delay (omega(sp)*T(theta(2))), pitch bandwidth as a function of time delay, and flight path as a function of pitch bandwidth. Determining the applicability of these criteria and gaining insight into the flying qualities of a large, supersonic aircraft are attempted. Where appropriate, YF-12, XB-70, and SR-71 pilot ratings are compared with the TU-144LL results to aid in the interpretation of the TU-144LL data and to gain insight into the application of criteria. The data show that approach and landing requirements appear to be applicable to the precision flightpath control required for up-and-away flight of large, supersonic aircraft. The Neal-Smith, control anticipation parameter, and pitch-bandwidth criteria tend to correlate with the pilot comments better than the phase delay criterion, omega(sp)*T(theta(2)). The data indicate that the detrimental flying qualities implication of decoupled pitch-attitude and flight-path responses occurring for high-speed flight may be mitigated by requiring the pilot to close the loop on flightpath or vertical speed.

Author

Supersonic Aircraft; TU-144 Aircraft; Flight Characteristics; Data Acquisition; Controllability; Bandwidth; Pilot Ratings; Aircraft Performance

20000052483 NASA Glenn Research Center, Cleveland, OH USA

On Flowfield Periodicity in the NASA Transonic Flutter Cascade, Part 1, Experimental Study

Lepicovsky, J., DYNACS Engineering Co., Inc., USA; McFarland, E. R., NASA Glenn Research Center, USA; Chima, R. V., NASA Glenn Research Center, USA; Wood, J. R., NASA Glenn Research Center, USA; March 2000; 16p; In English; 45th; International Gas Turbine and Aeroengine Technical Congress, 8-11 May 2000, Munich, Germany; Sponsored by American Society of Mechanical Engineers, USA; Original contains color illustrations

Contract(s)/Grant(s): NAS3-98008; RTOP 523-26-13

Report No.(s): NASA/TM-2000-209934/PT1; E-12179/PT1; NAS 1.15:209934/PT1; ASME-2000-GT-0572-Pt-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An extensive study to improve flow uniformity and periodicity in the NASA Transonic Flutter Cascade is presented here. The results are reported in two independent parts dealing with the experimental approach and the analytical approach. The first part, the Experimental Study, focuses first on the data sets acquired in this facility in the past and explains several discrepancies, particularly the questions of actual flow incidence and cascade back pressure levels. Next, available means for control and modifications of the cascade flowfield, boundary layer bleed and tailboard settings are presented in detail. This is followed by experimental data sets acquired in modified test facility configurations that were based on analytical predictions of the cascade flowfield. Finally, several important conclusions about improving the cascade flowfield uniformity and blade load periodicity are summarized. The important conclusions are: (1) boundary layer bleed does not improve the cascade flow periodicity; (2) tunnel wall contours must be carefully matched to the expected shape of cascade streamlines; (3) actual flow incidence for each cascade configuration rather must be measured instead of relying on the tunnel geometry; and (4) the current cascade configuration exhibits a very high blade load uniformity over six blades from blade #2 to blade #7, and the facility is now ready for unsteady pressure data acquisition.

Author

Boundary Layers; Cascade Flow; Data Acquisition; Prediction Analysis Techniques; Transonic Flutter

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety; and 85 Technology Utilization and Surface Transportation.

20000044724 Nebraska Univ., Aviation Inst., Omaha, NE USA

Journal of Air Transportation World Wide, Volume 5

Bowen, Brent D., Editor, Nebraska Univ., USA; Journal of Air Transportation World Wide; March 2000; ISSN 1093-8826; 140p; In English; See also 20000044725 through 20000044730

Report No.(s): UNO-AI-JATWW42; Copyright; Avail: Issuing Activity

The Journal's mission is to provide the global community immediate key resource information in all areas of air transportation. The goal of the Journal is to be recognized as the preeminent scholarly journal in the aeronautical aspects of transportation. As an international forum for peer-reviewed articles in all areas of aviation and space transportation research, policy, theory, case study, practice, and issues. While maintaining a broad scope, a focal point of the journal will be in the area of aviation administration and policy.

Author

Information Systems; Space Transportation; Research

20000044725 International Civil Aviation Organization, Montreal, Quebec Canada

Consequences of Slot Transactions on Airport Congestion and Environmental Protection

Abeyratne, Ruwantissa I.R., International Civil Aviation Organization, Canada; Journal of Air Transportation World Wide; March 2000; Volume 5, No. 1, pp. 13-36; In English; See also 20000044724; Copyright; Avail: Issuing Activity

Recent trends in the liberalization of market access by many commercial airlines have opened the skies to virtually unlimited flights between many countries. However, this liberalization is stultified by the lack of airport capacity to accommodate the many flights that are generated by demand for capacity. Accordingly, the allocation of slots for open skies airlines remain dependent

on the expansion and effective management of airport capacity. This article examines the ramifications of slot allocation on traffic peaking at airports and environmental concerns, which may emerge with this activity.
Author
Air Traffic; Airline Operations; Environment Protection; Slots

20000044726 Ohio Univ., Athens, OH USA
The ”Rock”: The Role of the Press in Bringing about Change in Aircraft Accident Policy
Johnson, Randy, Ohio Univ., USA; Journal of Air Transportation World Wide; March 2000; Volume 5, No. 1, pp. 38-58; In English; See also 20000044724; Copyright; Avail: Issuing Activity

From 1926 to 1938, the Aeronautics Branch, forerunner of the Federal Aviation Administration (FAA), had been charged with aircraft accident investigation. While the Branch had been investigating accidents since its inception, it had, early in its tenure, put into place a policy making its findings secret. Media and political pressure began to mount in late 1928 over its policy of nondisclosure and the debate brought pressure to bear on the young Aeronautics Branch to reverse its policy and make its findings public. The focusing event for the Branch’s policy reversal was the death of Knute Rockne, the famous Notre Dame football coach, in a Transcontinental and Western Airways (TWA) airliner on March 31, 193 1. This paper will examine the role of print media in bringing about a significant, and lasting, change in aircraft accident public-disclosure policy.
Author
Aircraft Accident Investigation; Policies; Transcontinental Systems

20000044727 Embry-Riddle Aeronautical Univ., Daytona Beach, FL USA
Service Quality in the US Airline Industry: Variations in Performance Within Airlines and Between Airlines and the Industry
Rhoades, Dawna L., Embry-Riddle Aeronautical Univ., USA; Waguespack, Blaise, Jr., Embry-Riddle Aeronautical Univ., USA; Journal of Air Transportation World Wide; March 2000; Volume 5, No. 1, pp. 60-76; In English; See also 20000044724; Copyright; Avail: Issuing Activity

This study examined the service quality of 25 U.S. airlines (1987-1996) using data from the Department of Transportation’s Air Travel Consumer Report. After a total quality and total complaint rate was calculated for these airlines, a 95 percent confidence interval was placed around the yearly and company means calculated to examine those cases that were significantly different from the mean. Results indicate that while the major carriers are converging toward a higher level of quality, there continues to be significant yearly variation. The service quality of regional carriers was much lower than major carriers and showed much greater variation.
Author
Services; Airline Operations; Civil Aviation; Q Factors

20000044728 Nebraska Univ., Kearney, NE USA
An Examination of the US Regional Airline Policies Regarding Child Restraint Systems
Carstenson, Larry, Nebraska Univ., USA; Sluti, Donald, Nebraska Univ., USA; Luedtke, Jacqueline, Utah State Univ., USA; Journal of Air Transportation World Wide; March 2000; Volume 5, No. 1, pp. 78-88; In English; See also 20000044724; Copyright; Avail: Issuing Activity

A prior study examined the policies of U.S. air carriers with regard to the use of infant restraint systems on board commercial aircraft. This study expands on that earlier study by examining the policies of commuter air carriers in the USA regarding the use of infant restraint systems. The management policy of the commuter air carriers has been investigated and officials of the commuter air carriers were surveyed to determine how the carriage of infants onboard their aircraft varied among commuter airlines. The topics investigated included seat space for infants, restraint systems for infants, and amenities for infant passengers. The results of this study have been analyzed to ascertain if any recommendations can be made to the commuter airlines regarding the carriage of infants onboard their aircraft.
Author
Air Transportation; Airline Operations; Policies

20000044729 London Univ., UK
Flying Lessons: Learning from Ryanair’s Cost Reduction Culture
Lawton, Thomas C., London Univ., UK; Journal of Air Transportation World Wide; March 2000; Volume 5, No. 1, pp. 89-106; In English; See also 20000044724; Copyright; Avail: Issuing Activity

Through radically improving the value equation for airline customers, Ryanair has served to shake-up established norms and practices in European aviation. Underpinning its price leadership and market success is a vigorous and relentless cost reduction ethos and resultant low break-even load factor. Ryanair has lowered European airline cost structures considerably, shattering existing cost floors. Few competitors are able to follow, either because they do not know how or they are unable due to social settlement obligations or service commitments. At the same time, the company has maintained high average load factors on its flights. Taken in conjunction with its low break-even load factor, this results in consistently high overall profit margins. On this basis, Ryanair is likely to remain a significant competitor and increase its market presence and success across Europe.
Author
Airline Operations; Cost Reduction; Procedures

20000044730 NASA Johnson Space Center, Houston, TX USA
Culture in the Cockpit-CRM in a Multicultural World
Engle, Michael, NASA Johnson Space Center, USA; Journal of Air Transportation World Wide; March 2000; Volume 5, No. 1, pp. 107-118; In English; See also 20000044724; Copyright; Avail: Issuing Activity

Crew Resource Management (CRM) is fundamentally a method for enhancing personal interactions among crewmembers so that safety and efficiency are increased, and at its core involves issues of culture and social interaction. Since CRM is increasingly being adopted by foreign carriers, it is important to evaluate standard CRM techniques from a cultural standpoint, especially if some of these techniques may be enhanced by adapting them to particular cultures. The purpose of this paper is to propose a model for an ideal CRM culture, and to suggest ways that CRM may be adapted to suit particular cultures. The research method was a simple literature search to gather data on CRM techniques and multicultural crews. The results indicate that CRM can be tailored to specific cultures for maximum effectiveness.
Author
Cockpits; Resources Management; Procedures

20000046628 Cranfield Univ., Cranfield, UK
The Role of Capital Productivity in British Airways' Financial Recovery
Morrell, Peter, Cranfield Univ., UK; Journal of Air Transportation World Wide; 1999; ISSN 1093-8826; Volume 4, No. 2, pp. 84-98; In English; Copyright; Avail: Issuing Activity

British Airways (BA) was privatized in 1987, but its financial recovery occurred a number of years earlier, This recovery was sustained throughout the early 1990s economic recession, a period when few major airlines were operating profitably. This paper examines the role of productivity developments at British Airways from the early 1980s through 1996. The emphasis is on capital productivity and investment, but changes in capital intensity and labour productivity are also evaluated. Various measures are considered for both capital and labour productivity: outputs are measured in available tonne-kms (ATKs) and revenue tonne-kms (RTKs), with the former preferred over the latter two measures, after adjustment for work performed by BA for others. Capital inputs are measured in equivalent lease costs adjusted to constant prices with a different treatment of flight and ground equipment or assets. Labour inputs are derived from total payroll costs deflated by a UK wage price index. The airline made considerable capital investments over the period and at the same time went through two major processes of labour restructuring. This resulted in a gradual increase in capital intensity, relative high labour productivity growth, but poor capital productivity performance, However, capital investment played an important role in the airline's sustained labour and total factor productivity over the whole period.
Author
UK; Airline Operations; Civil Aviation; Cost Analysis; Productivity

20000046629 Cranfield Univ., Bedford, UK
The Effect of Corporate Influence in the Short Haul Business Travel Market
Mason, Keith J., Cranfield Univ., UK; Journal of Air Transportation World Wide; 1999; ISSN 1093-8826; Volume 4, No. 2, pp. 66-82; In English; Copyright; Avail: Issuing Activity

The importance of corporate involvement in the decision making process for business related air travel is being increasingly recognized in the literature. Business travellers consume air services (i.e. they take airline flights), however; they may not be the principal decision-maker in the purchase, Also it is the organization that employs the traveller that incurs the cost for air travel, Consequently this research addresses the relationship between the traveller and the employing organization in the purchase of air travel. In this paper traveller opinions on their corporate travel policy are evaluated using a Likert summated rating scale. The benefits sought, by the traveller, from the air service are also investigated and these benefits are used to segment the short haul

business air travel market in the EU. Changes in the market for short haul business travel since the full liberalisation of the aviation market in the EU are evaluated by comparing the data to an earlier study of similar travellers in 1992.
Author
Policies; Organizations; Airline Operations; Decision Making

20000046631 Jordan Univ. of Science and Technology, Irbid, Jordan
Stochastic Modeling of Airlines' Scheduled Services Revenue
Hamed, M. M., Jordan Univ. of Science and Technology, Jordan; Journal of Air Transportation World Wide; 1999; ISSN 1093-8826; Volume 4, No. 2, pp. 32-48; In English; Copyright; Avail: Issuing Activity

Airlines' revenue generated from scheduled services account for the major share in the total revenue. As such, predicting airlines' total scheduled services revenue is of great importance both to the governments (in case of national airlines) and private airlines. This importance stems from the need to formulate future airline strategic management policies, determine government subsidy levels, and formulate governmental air transportation policies. The prediction of the airlines' total scheduled services revenue is dealt with in this paper. Four key components of airline's scheduled services are considered. These include revenues generated from passenger, cargo, mail, and excess baggage. by addressing the revenue generated from each schedule service separately, air transportation planners and designers arc able to enhance their ability to formulate specific strategies for each component. Estimation results clearly indicate that the four stochastic processes (scheduled services components) are represented by different Box-Jenkins ARIMA models. The results demonstrate the appropriateness of the developed models and their ability to provide air transportation planners with future information vital to the planning and design processes.
Author
Stochastic Processes; Mathematical Models; Airline Operations; Schedules; Revenue; Services; Air Transportation

20000046632 University of Southern Georgia, Statesboro, GA USA
Outsourcing as an Airline Strategy
Brown, John H., University of Southern Georgia, USA; Rutner, Stephen M., University of Southern Georgia, USA; Journal of Air Transportation World Wide; 1999; ISSN 1093-8826; Volume 4, No. 2, pp. 22-30; In English; Copyright; Avail: Issuing Activity

Since the deregulation of the airline industry, carriers have searched for any method to improve their competitive position. At the same time, there has been a growth in the use of Third Party Logistics throughout corporate America, This paper presents an overview of the Third Party Logistics system of outsourcing and insourcing within the airline industry. This discussion generated a number of propositions, possible future scenarios and opportunities for empirical testing.
Author
Logistics; Airline Operations

20000046633 Belgrade Univ., Yugoslavia
Determining Usability Versus Cost and Yields of a Regional Transport
Gvozdenovic, Slobodan, Belgrade Univ., Yugoslavia; Journal of Air Transportation World Wide; 1999; ISSN 1093-8826; Volume 4, No. 2, pp. 120; In English; Copyright; Avail: Issuing Activity

Regional transports are designed to operate on air networks having the basic characteristics of short trip distances and low density passengers/cargo, i.e. small numbers of passengers per flight. Regional transports passenger capacity is from 10 to 100 seats and operate on routes from 350 to 1000 nautical miles (nm). An air network operated by regional transports has the following characteristics: (1) connecting regional centers; (2) operating on low density passengers/cargo flow services with minimum two frequencies per day; (3) operating on high density passengers/cargo flow with more than two frequencies per day; and (4) operating supplemental services whenever market demands in order to help bigger capacity aircraft already operating the same routes. In order to meet passenger requirements providing low fares and high or required number of frequencies, airlines must constantly monitor operational costs and keep them low. It is obvious that costs of operating aircraft must be lower than yield obtained by transporting passengers and cargo. The requirement to achieve favorable yield/cost ratio must provide the answer to the question of which aircraft will best meet a specific air network. An air network is defined by the number of services, the trip distance of each service, and the number of flights (frequencies) per day and week.
Derived from text
User Requirements; Commercial Aircraft; Operating Costs; Cargo; Airline Operations

20000050363 Federal Aviation Administration, Washington, DC USA
Notices to Airmen, Domestic/International, March 23, 2000
Mar. 23, 2000; 288p
Report No.(s): PB2000-104213; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche
Contents include the following: Airway Notams; Airports, Facilities, and Procedural Notams; General FDC Notams; Part 95 Revisions to Minimum En Route IFR Altitudes and Changeover Points; International Notices to Airmen; and Graphic Notices.
NTIS
Air Navigation; Runways; Airports; Graphs (Charts)

20000051482 Federal Aviation Administration, Office of Aviation Policy and Plans, Washington, DC USA
FAA Aerospace Forecasts: Fiscal Years 2000-2011
Mar. 2000; 304p; In English
Report No.(s): PB2000-104047; FAA-APO-00-1; No Copyright; Avail: CASI; A03, Microfiche; A14, Hardcopy
This report contains the Fiscal Years 2000-2011 Federal Aviation Administration (FAA) forecasts of aviation activity at FAA facilities. These include airports with FAA and contract control towers, air route traffic control centers, and flight service stations. Detailed forecasts were developed for the major users of the National Aviation System--air carriers, air taxi/commuters, general aviation, and military. The forecasts have been prepared to meet the budget and planning needs of the constituent units of the FAA and to provide information that can be used by State and local authorities, the aviation industry, and the general public.
NTIS
Aerospace Industry; Forecasting; Airport Towers; Air Traffic Control; Aircraft Industry; National Aviation System

20000051522 Bureau of Transportation Statistics, Office of Airline Information, Washington, DC USA
Air Carrier Reporting Punctuality Assessment: Accounting and Reporting Directive, No. 243
Mar. 03, 2000; 14p; In English
Report No.(s): PB2000-103416; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Office of Airline Information issues its latest 'Air Carrier Reporting Punctuality Assessment' report. The report is issued quarterly covering the most recent six-month period. This report covers the period from July 1, 1999, through December 31, 1999.
NTIS
Air Transportation; Airline Operations

20000051533 Civil Aeromedical Inst., Civil Aeromedical Inst., Oklahoma City, OK USA
Comparing Text and Graphics in Navigation Display Design *Final Report*
Williams, Kevin W.; Feb. 2000; 16p; In English
Report No.(s): AD-A375445; DOT/FAA/AM-00/8; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Thirty-six pilots were tested in a flight simulator on their ability to decide which of two airports was farther from a storm front, based on the manner in which information was presented on a navigational display. The results support the superiority of graphical over textual information display of nearest airport information. Pilots were significantly faster using the map display than using either the text-only display or the enhanced-text display. In addition, in contrast to an earlier study (Williams, 1999), pilots performed better using a north-up map than when using a track-up map. Discussion of the results focuses on recommendations for moving-map displays and the display requirements for support of the nearest-airport function within a navigational display.
DTIC
Air Navigation; Display Devices; Navigation Aids; Pilot Training; Flight Simulators; Pilot Performance; Storms (Meteorology)

20000052252 Naval Aerospace Medical Research Lab., Pensacola, FL USA
Predicting Primary Flight Grades by Averaging Over Linear Regression Models: Part I
Blower, D. J.; Williams, H. P.; Albert, A. O.; Jan. 01, 2000; 20p; In English
Report No.(s): AD-A375398; NAMRL-1410; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report documents an investigation into two types of variables that might be useful in predicting flight grades in Navy primary flight training. The first set of predictor variables is largely psychomotor in origin and is part of the Computer-Based Performance Test Battery at the Naval Aerospace Medical Research Laboratory. The second set of variables is more cognitive in nature and arises from scores on the Aviation Selection Test Battery (ASTB) and a final grade in Aviation Pre-Flight Indoctrination (API), which is ground school prior to entering primary flight training. The motivation for this research is a joint effort with the Air Force designed to improve selection tests for military aviators. The emphasis in this report is on how to choose good linear regression models which use these variables to predict a criterion variable such as flight grade. In our present case, we have a total

of 25 potential predictor variables. As a result, there is a rather large number of possible regression models. Our task is to pick some relatively small number of models that are best by some acceptable statistical criterion. The analysis revealed that models with a small number of predictor variables were much superior to models that included a large number of the 25 available variables. The best models consisted of two, three, and four predictor variables and possessed an R2 of about .35. The single best model contained the final grade from API, a psychomotor tracking variable, and a score from one of the ASTB subtests. A prediction of the flight grade can then be made by averaging over the individual predictions of the single models. Using Bayesian model evaluation techniques, the averaging is carried out by weighting each individual model according to its posterior probability.
DTIC
Performance Prediction; Evaluation; Aircraft Pilots; Personnel Selection; Psychomotor Performance; Pilot Performance

20000052256 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA
Situation Awareness in Air Traffic Control: Enhanced Displays for Advanced Operations
Endsley, Mica; Sollenberger, Randy; Nakata, Akiko; Stein, Earl S.; Jan. 2000; 55p; In English
Report No.(s): AD-A375375; DOT/FAA/CT-TN00/01; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Future changes in the National Airspace System indicate a self-separation operational concept. This study examined the Air Traffic Control Specialist's ability to maintain situation awareness and provide needed monitoring and separation functions under this concept. The study also provides an empirical evaluation of the effects of an enhanced display concept as a window on the existing air traffic control radar display. This window furnished the targeted altitude or heading of aircraft in a transitionary state. This information simulated that provided by a data link from the aircraft flight management system in a future air traffic operation. The introduction of the enhanced display appeared to have some utility in aiding controllers in dealing with air traffic operating under self-separation. The enhanced display resulted in improvements in some air traffic control performance and situation awareness measures. Results suggest that further improvements in the enhanced display may better integrate it with the controller radar display. In addition, researchers recommend methods for measuring controller situation awareness in future air traffic control research.
DTIC
Air Traffic Control; Air Traffic Controllers (Personnel); Flight Management Systems; Pilot Support Systems; National Airspace System

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications; Spacecraft Communications, Command and Tracking, and 32 Communications and Radar.

20000045693 Georgia Inst. of Tech., Dept. of Industrial and Systems Engineering, Atlanta, GA USA
Pilot Performance on New ATM Operations: Maintaining In-Trail Separation and Arrival Sequencing
Pritchett, Amy R., Georgia Inst. of Tech., USA; Yankosky, L. J., Georgia Inst. of Tech., USA; [1999]; 8p; In English
Contract(s)/Grant(s): NAG2-1178; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Cockpit Display of Traffic Information (CDTI) may enable new Air Traffic Management (ATM) operations. However, CDTI is not the only source of traffic information in the cockpit; ATM procedures may provide information, implicitly and explicitly, about other aircraft. An experiment investigated pilot ability to perform two new ATM operations - maintaining in-trail separation from another aircraft and sequencing into an arrival stream. In the experiment, pilots were provided different amounts of information from displays and procedures. The results are described.
Author
Pilot Performance; Air Traffic Control; Experimentation

20000047449 Research and Technology Organization, Systems Concepts and Integration Panel, Neuilly-sur-Seine, France
Flight Testing of Radio Navigation Systems *les Essais en vol des systemes de radionavigation*
April 2000; 83p; In English; CD ROM contains the entire document presented in PDF format
Report No.(s): RTO-AG-300-Vol-18; AC/323(SCI)TP/26-Vol-18; ISBN 92-837-1039-8; Copyright Waived; Avail: CASI; A05, Hardcopy; A01, Microfiche; C01, CD-ROM

Civil as well as military aviation relies on a number of radio navigation systems including satellite systems in space. As new systems are developed extensive flight testing is needed to ensure that the design parameters are met. The approval of every new

installation is dependent on flight tests. Moreover, all installations require flight inspection in well-defined time periods. The development and application of cost effective flight test techniques and instrumentation systems including the test aircraft are presented. Room is given also to the adverse effects of radio wave propagation like multipath.
Author
Flight Tests; Radio Navigation; Navigation Aids; Inspection

20000052474 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Ionosphere Delay Calibration and Calibration Errors for Satellite Navigation of Aircraft
Harris, Ian, Jet Propulsion Lab., California Inst. of Tech., USA; Manucci, Anthony, Jet Propulsion Lab., California Inst. of Tech., USA; Iijima, Byron, Jet Propulsion Lab., California Inst. of Tech., USA; Lindqwister, Ulf, Jet Propulsion Lab., California Inst. of Tech., USA; Muna, Demitri, Jet Propulsion Lab., California Inst. of Tech., USA; Pi, Xiaoqing, Jet Propulsion Lab., California Inst. of Tech., USA; Wilson, Brian, Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 8p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Federal Aviation Administration (FAA) is implementing a satellite-based navigation system for aircraft using the Global Positioning System (GPS). Positioning accuracy of a few meters will be achieved by broadcasting corrections to the direct GPS signal. These corrections are derived using the wide-area augmentation system (WAAS), which includes a ground network of at least 24 GPS receivers across the Continental US (CONUS). WAAS will provide real-time total electron content (TEC) measurements that can be mapped to fixed grid points using a real-time mapping algorithm. These TECs will be converted into vertical delay corrections for the GPS L1 frequency and broadcast to users every five minutes via geosynchronous satellite. Users will convert these delays to slant calibrations along their own lines-of-sight (LOS) to GPS satellites. Uncertainties in the delay calibrations will also be broadcast, allowing users to estimate the uncertainty of their position. to maintain user safety without reverting to excessive safety margins an empirical model of user calibration errors has been developed. WAAS performance depends on factors that include geographic location (errors increase near WAAS borders), and ionospheric conditions, such as the enhanced spatial electron density gradients found during ionospheric storms.
Author
Calibrating; Error Analysis; Global Positioning System; Positioning; Air Navigation; Ionospheric Noise

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20000044866 NASA Ames Research Center, Moffett Field, CA USA
A Computational/Experimental Study of Two Optimized Supersonic Transport Designs and the Reference H Baseline
Cliff, Susan E., NASA Ames Research Center, USA; Baker, Timothy J., Princeton Univ., USA; Hicks, Raymond M., NASA Ames Research Center, USA; Reuther, James J., NASA Ames Research Center, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 845-967; In English; See also 20000044865; No Copyright; Avail: CASI; A06, Hardcopy; A06, Microfiche

Two supersonic transport configurations designed by use of non-linear aerodynamic optimization methods are compared with a linearly designed baseline configuration. One optimized configuration, designated Ames 7-04, was designed at NASA Ames Research Center using an Euler flow solver, and the other, designated Boeing W27, was designed at Boeing using a full-potential method. The two optimized configurations and the baseline were tested in the NASA Langley Unitary Plan Supersonic Wind Tunnel to evaluate the non-linear design optimization methodologies. In addition, the experimental results are compared with computational predictions for each of the three configurations from the Enter flow solver, AIRPLANE. The computational and experimental results both indicate moderate to substantial performance gains for the optimized configurations over the baseline configuration. The computed performance changes with and without diverters and nacelles were in excellent agreement with experiment for all three models. Comparisons of the computational and experimental cruise drag increments for the optimized configurations relative to the baseline show excellent agreement for the model designed by the Euler method, but poorer comparisons were found for the configuration designed by the full-potential code.
Author
Nonlinearity; Design Analysis; Optimization; Supersonic Transports; Supersonic Wind Tunnels

20000044867 Boeing Commercial Airplane Co., Seattle, WA USA

Update to the "Summary of Langley Unitary Test 1649 and its Implications on Validity of Viscous and Inviscid Analyses"

Yaghmaee, S., Boeing Commercial Airplane Co., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 969-1007; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The present report is meant to update the TLNSMB calculated results reported in the first NASA/Industry Configuration Aerodynamics Workshop held at NASA Langley Research Center. The update arises from the erroneous inclusion of the forces on the aft-body section of the configurations when comparing the results to the experimental data. Although, this update has little impact on the incremental data, it does considerably improve the agreement in the absolute lift and drag levels. In particular, the calculated drag level is now within a count of experimental data when corrected for the trip drag.

Author

Aerodynamic Configurations; Aerodynamics; Aerodynamic Drag; Viscous Flow; Inviscid Flow

20000044868 McDonnell-Douglas Aerospace, Long Beach, CA USA

Supersonic Aerodynamic Design Improvements of an Arrow-Wing HSCT Configuration Using Nonlinear Point Design Methods

Unger, Eric R., McDonnell-Douglas Aerospace, USA; Hager, James O., McDonnell-Douglas Aerospace, USA; Agrawal, Shreekant, McDonnell-Douglas Aerospace, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1009-1040; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This paper is a discussion of the supersonic nonlinear point design optimization efforts at McDonnell Douglas Aerospace under the High-Speed Research (HSR) program. The baseline for these optimization efforts has been the M2.4-7A configuration which represents an arrow-wing technology for the High-Speed Civil Transport (HSCT). Optimization work on this configuration began in early 1994 and continued into 1996. Initial work focused on optimization of the wing camber and twist on a wing/body configuration and reductions of 3.5 drag counts (Euler) were realized. The next phase of the optimization effort included fuselage camber along with the wing and a drag reduction of 5.0 counts was achieved. Including the effects of the nacelles and diverters into the optimization problem became the next focus where a reduction of 6.6 counts (Euler W/B/N/D) was eventually realized. The final two phases of the effort included a large set of constraints designed to make the final optimized configuration more realistic and they were successful albeit with a loss of performance.

Author

Aerodynamic Configurations; Arrow Wings; Body-Wing Configurations; Nonlinearity; Design Analysis; Optimization

20000044869 McDonnell-Douglas Aerospace, Long Beach, CA USA

Experimental Investigation of a Point Design Optimized Arrow Wing HSCT Configuration

Narducci, Robert P., McDonnell-Douglas Aerospace, USA; Sundaram, P., McDonnell-Douglas Aerospace, USA; Agrawal, Shreekant, McDonnell-Douglas Aerospace, USA; Cheung, S., McDonnell-Douglas Aerospace, USA; Arslan, A. E., McDonnell-Douglas Aerospace, USA; Martin, G. L., McDonnell-Douglas Aerospace, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1041-1071; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The M2.4-7A Arrow Wing HSCT configuration was optimized for straight and level cruise at a Mach number of 2.4 and a lift coefficient of 0.10. A quasi-Newton optimization scheme maximized the lift-to-drag ratio (by minimizing drag-to-lift) using Euler solutions from FL067 to estimate the lift and drag forces. A 1.675% wind-tunnel model of the Opt5 HSCT configuration was built to validate the design methodology. Experimental data gathered at the NASA Langley Unitary Plan Wind Tunnel (UPWT) section #2 facility verified CFL3D Euler and Navier-Stokes predictions of the Opt5 performance at the design point. In turn, CFL3D confirmed the improvement in the lift-to-drag ratio obtained during the optimization, thus validating the design procedure. A data base at off-design conditions was obtained during three wind-tunnel tests. The entry into NASA Langley UPWT section #2 obtained data at a free stream Mach number, M(sub infinity), of 2.55 as well as the design Mach number, M(sub infinity)=2.4. Data from a Mach number range of 1.8 to 2.4 was taken at UPWT section #1. Transonic and low supersonic Mach numbers, M(sub infinity)=0.6 to 1.2, was gathered at the NASA Langley 16 ft. Transonic Wind Tunnel (TWT). In addition to good agreement between CFD and experimental data, highlights from the wind-tunnel tests include a trip dot study suggesting a linear relationship between trip dot drag and Mach number, an aeroelastic study that measured the outboard wing deflection and twist,

and a flap scheduling study that identifies the possibility of only one leading-edge and trailing-edge flap setting for transonic cruise and another for low supersonic acceleration.
Author
Aerodynamic Configurations; Arrow Wings; Transonic Wind Tunnels; Wind Tunnel Models; Wind Tunnel Tests; Computational Fluid Dynamics; Navier-Stokes Equation; Data Flow Analysis

20000045695 NASA Ames Research Center, Moffett Field, CA USA
Secondary Wing System for Use on an Aircraft
Smith, Brian E., Inventor, NASA Ames Research Center, USA; Nov. 30, 1999; 20p; In English
Patent Info.: Filed 13 Mar. 1997; NASA-Case-ARC-14122-1; US-Patent-5,992,796; US-Patent-Appl-SN-828826; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A secondary wing system for use on an aircraft augments the lift, stability, and control of the aircraft at subsonic speeds. The secondary wing system includes a mechanism that allows the canard to be retracted within the contour of the aircraft fuselage from an operational position to a stowed position. The top surface of the canard is exposed to air flow in the stowed position, and is contoured to integrate aerodynamically and smoothly within the contour of the fuselage when the canard is retracted for high speed flight. The bottom portion of the canard is substantially flat for rotation into a storage recess within the fuselage. The single canard rotates about a vertical axis at its spanwise midpoint. The canard can be positioned between a range of sweep angles during flight and a stowed position in which its span is substantially parallel to the aircraft fuselage. The canard can be deployed and retracted during flight. The deployment mechanism includes a circular mounting ring and drive mechanism that connects the canard with the fuselage and permits it to rotate and to change incidence. The deployment mechanism further includes retractable fairings which serve to streamline the wing when it is retracted into the top of the fuselage.
Author
Airspeed; Canard Configurations; Fuselages; Retractable Equipment; Rotation; Wings; Sweep Angle; Lift Augmentation

20000045991 McDonnell-Douglas Corp., Long Beach, CA USA
Supersonic Cruise Point Design Optimization of TCA
Unger, Eric R., McDonnell-Douglas Corp., USA; Narducci, Robert P., McDonnell-Douglas Corp., USA; Hager, James O., McDonnell-Douglas Corp., USA; Kuruvila, Geojoe, McDonnell-Douglas Corp., USA; Hartwich, Peter M., McDonnell-Douglas Corp., USA; Agrawal, Shreekant, McDonnell-Douglas Corp., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 114-188; In English; See also 20000045988; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

Since July of 1996, McDonnell Douglas (along with other teams from NASA Ames and Boeing Commercial Aircraft Group), has been working on a second series of optimizations for the TCA configuration. The approach used at MDC was conservative in terms of acceptable geometric qualities that were allowed to appear in the final Cycle 2 design. The hope was that any final outcome would be more robust and raise the least amount of uncertainties from other technology disciplines. The downside of this approach was the inability to fully maximize the possible L/D gains within the given, time and within these strict geometric guidelines. This paper presents an overview of MDC's final Cycle 2 configuration. First, a brief introduction and highlights of the new design are given along with some geometric details. Second, a look at the configuration's overall performance and pressure field details will be given. Next, some details of the design constraints that were used during optimization will be described. And finally, the paper will close with a summary of the Cycle 2 configuration and a look ahead to the immediate future.
Author
Design Analysis; Optimization; Supersonic Speed; Body-Wing Configurations; Civil Aviation

20000045993 McDonnell-Douglas Aerospace, Long Beach, CA USA
TCA Nacelle Installation Assessment and Design Studies
Arslan, Alan, McDonnell-Douglas Aerospace, USA; Sundaram, Pichuraman, McDonnell-Douglas Aerospace, USA; Shieh, Chih-Fang, McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 255-304; In English; See also 20000045988; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This paper presents the computational investigation of the PAI related study in which the primary objective is to assess and then reduce the installation drag of the nacelles for the TCA configuration at the supersonic cruise condition of M (sub infinity)= 2.4, C (sub L) = 0.1 As a first step in reducing the nacelle installation drag, it is necessary to assess the baseline installation. This assessment refers to interference and installation drag assessments, as well as flowfield assessment, at both flight (Re (sub c) = 212 million) and wind-tunnel (Re (sub c) = 6.36 million) conditions. An analysis of the inlet flowfield quality is necessary to assess

alignment. After satisfying inlet constraints by aligning the inlets with the local flowfield, the drag is reassessed. An assessment of the boundary layer height at the diverter leading edge suggests a height reduction for the inboard diverter. Finally, diverter and nacelle shape modifications were attempted with limited success.
Author
Installing; Nacelles; Body-Wing Configurations; Civil Aviation; Diverters; Wind Tunnel Tests; Design Analysis

20000045995 McDonnell-Douglas Corp., Long Beach, CA USA
Uncertainties in HSCT Cruise Drag Prediction
Agrawal, Shreekant, McDonnell-Douglas Corp., USA; Novean, Michael G. B., McDonnell-Douglas Corp., USA; Kuruvila, Geojoe, McDonnell-Douglas Corp., USA; Narducci, Robert P., McDonnell-Douglas Corp., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 376-440; In English; See also 20000045988; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

Within the High Speed Research (HSR) program, NASA and Industry are jointly developing various technologies so that the U.S. Industry has the capability to launch the High Speed Civil Transport (HSCT) aircraft development in early 2000. One of the primary objectives of the HSR program is to be able to predict the cruise aerodynamic performance of the HSCT configurations with a sufficiently high confidence level that will aide industry in the decision to proceed with the development of the, aircraft and guarantee its performance to its airline customers. This paper addresses the current status in the prediction of drag at primarily the supersonic cruise Mach number (M = 2.4), however, drag at the transonic cruise Mach number (M = 0.9) is also presented, wherever appropriate. The thrust of this paper is the uncertainty (or the confidence level) in drag prediction. Use is made of the available experimental, linear and nonlinear computational, and empirical database to the McDonnell Douglas Corporation (MDC). In some cases, there is sufficient database; in some other cases, there is very little database; and yet in some other cases, there is none available. However, an attempt is made to see where we stand today in the cruise drag prediction, although it is difficult to determine uncertainty levels in all the elements contributing to drag. Please note that the uncertainty levels discussed here are the views of the researchers at MDC only, and they may not represent those at other organizations.
Author
Civil Aviation; Supersonic Transports; Supersonic Speed; Aerodynamic Characteristics; Performance Prediction; Aerodynamic Drag

20000045999 NASA Langley Research Center, Hampton, VA USA
Analysis and Multipoint Design of the TCA Concept
Krist, Steven E., NASA Langley Research Center, USA; Bauer, Steven X. S., NASA Langley Research Center, USA; Buning, Pieter G., NASA Langley Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 544-560; In English; See also 20000045988; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The goal in this effort is to analyze the baseline TCA concept at transonic and supersonic cruise, then apply the natural flow wing design concept to obtain multipoint performance improvements. Analyses are conducted with OVERFLOW, a Navier-Stokes code for overset grids, using PEGSUS to compute the interpolations between the overset grids.
Author
Civil Aviation; Transonic Flow; Supersonic Flow; Body-Wing Configurations; Design Analysis

20000046000 NASA Langley Research Center, Hampton, VA USA
TLNS3D/CDISC Multipoint Design of the TCA Concept
Campbell, Richard L., NASA Langley Research Center, USA; Mann, Michael J., NASA Langley Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 561-586; In English; See also 20000045988; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This paper presents the work done to date by the authors on developing an efficient approach to multipoint design and applying it to the design of the HSR TCA (High Speed Research Technology Concept Aircraft) configuration. While the title indicates that this exploratory study has been performed using the TLNS3DMB flow solver and the CDISC (Constrained Direct Iterative Surface Curvature) design method, the CDISC method could have been used with any flow solver, and the multipoint design approach does not require the use of CDISC. The goal of the study was to develop a multipoint design method that could achieve a design in about the same time as 10 analysis runs.
Author
Civil Aviation; Supersonic Transports; Curvature; Design Analysis; Multigrid Methods

20000046005 McDonnell-Douglas Aerospace, Long Beach, CA USA

Comparison of Linearized Potential Flow Design and Analysis Codes

Morgenstern, John, McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 729-776; In English; See also 20000045988; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The purpose of this task is to compare high speed aerodynamics design methods to find the most accurate and consistent methods for use in HSR Technology Integration studies. In order to compare design methods for Technology Integration, we first separate drag into the components that each method predicts. CD Friction process differences have been quantified and should not affect drag trends between designs; therefore, the differences are considered acceptable. Based on previous work, differences in CD Wave were relatively small and probably due to differences in the geometry analyzed and the number of cuts used--process improvements are still under investigation. CD Induced and ACD Nacelles were known to have the largest differences, so the most effort has been concentrated in those two areas. This paper discusses only the CD Induced results.

Derived from text

Potential Flow; Linearization; Computational Fluid Dynamics; Aircraft Design; Codes

20000046623 Army Safety Center, Fort Rucker, AL USA

Flightfax: Army Aviation Risk-Management Information. Volume 28, Number 3, March 2000

Mar. 2000; 6p; In English

Report No.(s): AD-A375683; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Flightfax is published by the U.S. Army Safety Center, Fort Rucker, AL 36362-5363. Information is for accident-prevention purposes only and is specifically prohibited for use for punitive purposes or matters of liability litigation, or competition.

DTIC

Safety; Reconnaissance Aircraft; Risk; Management Information Systems; Information Management; Accident Prevention

20000046793 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA

Metallurgical Examination of a Failed Blade Lag Shock Absorber (Part No. 114H6802) From a CH-47D Chinook Cargo Helicopter ***Final Report, Sep. 1995 to present***

Pepi, Marc S.; Grendahl, Scott M.; Champagne, Victor K.; Mar. 2000; 89p; In English

Contract(s)/Grant(s): Proj-SM2D50

Report No.(s): AD-A375958; ARL-TR-2191; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A metallurgical examination was performed on a failed blade lag shock absorber from the aft red rotor blade of an Army cargo helicopter. The U.S. Army Research Laboratory (ARL) and the primary contractor (Boeing Helicopters, Philadelphia, PA) performed a visual examination of the failed part, fluorescent penetrant inspection, fractographic evaluation, metallography, hardness testing, conductivity testing, and chemical analysis. It was concluded that the part failed due to fatigue from an area exhibiting intergranular attack. The corrosive attack was most likely caused by the processing fluids used during the rework process. In addition, the parts may not have been properly aged, as evidenced by the higher-than-nominal yield strength values. An improper aging treatment could have facilitated the intergranular attack.

DTIC

CH-47 Helicopter; Metallography; Shock Absorbers; Rotor Blades; Structural Failure

20000047291 Dassault Aviation, Saint-Cloud, France

Technology Trends for Future Business Jet Airframe

Rouquet, A., Dassault Aviation, France; Chaumette, D., Dassault Aviation, France; New Metallic Materials for the Structure of Aging Aircraft; April 2000, pp. 3-1 - 3-4; In English; See also 20000047290; Original contains color illustrations; Copyright Waived; Avail: CASI; A01, Hardcopy

Today's aerospace market is extremely tough; the constant quest for reduced production cost in existing airframes may provide an opportunity for introducing new technologies through re-engineering of structural component. This paper highlights the approach used at Dassault Aviation for the Falcon business jet family. Within the technologies patchwork, choices and solutions are reviewed and discussed using examples.

Author

Technology Assessment; Cost Reduction; Aerospace Industry

20000047292 Defence Evaluation Research Agency, Mechanical Sciences Sector, Farnborough, UK

Future Aluminium Technologies and their Application to Aircraft Structures

Borradaile, J. B., Defence Evaluation Research Agency, UK; New Metallic Materials for the Structure of Aging Aircraft; April 2000, pp. 4-1 - 4-4; In English; See also 20000047290; Copyright Waived; Avail: CASI; A01, Hardcopy

Aluminium remains a predominant material for airframes. Carbon fibre composites and titanium alloys have made in roads especially in some military airframes such as Typhoon and Tornado. However with affordability now having equal emphasis to the classical performance requirements in aircraft design, such as speed. range, payload and stealth, aluminium could soon recover some of these applications. Aerospace manufacturers are giving significant attention to developments in the areas of new aluminium materials, low cost manufacturing and unitized structures. The latter is because the cost of producing aircraft is being driven by the cost of assembly which drives production towards fewer, cheaper-to-assemble parts, whilst maintaining close tolerance in manufacture.

Author

Aluminum; Technology Assessment; Aircraft Structures; Airframes; Carbon Fibers; Fiber Composites; Titanium Alloys

20000048750 NASA Langley Research Center, Hampton, VA USA

Evaluation of Alternate Control Surface Concepts

Campbell, Bryan, NASA Langley Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, pp. 2385-2407; In English; See also 20000048733; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Although several viable concepts have been investigated during recent years, time constraints do not allow for a detailed discussion of each. Therefore, only a small segment of these concepts will be discussed during this workshop. Emphasis will be placed on canards, forebody chimes and wing fins. The majority of the data presented were obtained using a 0.01542 scale representation of the HSR Reference-H model. This model was similar in planform, and incorporated fullspan leading-edge flaps and segmented trailing-edge flaps. The high-lift configuration of leading-edges at 30 degrees, and trailing-edges at 10 degrees are shown. The wing had no twist or camber. The forebody and fuselage were simple bodies of revolution. A detachable aft fuselage, complete with empennage, was incorporated during the chine study, and removed during the canard tests. The overall length (including aft fuselage) was approximately 58 inches; and the span was 24 inches.

Derived from text

Canard Configurations; Control Surfaces; Forebodies; Fins; Lift

20000051538 La Sapienza Univ., Dipt. Aerospaziale, Rome, Italy

AGING SYSTEMS IN AERONAUTICS AND SPACE DAMAGE TOLERANCE IN HELICOPTERS

Santini, Paolo, La Sapienza Univ., Italy; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. K1-1 - K1-9; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

The aim of this keynote lecture should be that of introducing the main (or, at least, the common) features of the papers that will be presented during the Workshops that will take place in Corfou this week: Aging Aeronautical Systems, Life Extension for Helicopters, Propulsion and Gas Generators for aerospace vehicles. A keynote lecture may be given in several ways. The most obvious form is probably an overview of the subjects that are to be discussed, trying to connect them together, so as to prepare the audience to a more detailed knowledge of them. However, in this way one runs the risk of saying something that will be repeated much better by the specific Authors, (and, often in a much poorer way than the Authors themselves), also because the time is in general very short. Another way is to address and illustrate forthcoming need and future trends in the area of interest: for this kind of presentation it would be necessary to be able to predict the future, because it happens very often that the future is not so smooth as everybody may imagine at the time of the lecture, and so, after a few years, or even a few months, needs and trends are completely different: a good example is the continuous series of war actions in the Balkans and in the Middle East, that may have a strong impact on the policy of the aeronautical production. I have chosen another approach. When AGARD was established, I had the chance to take part in the first meeting in 1952, and I can well remember the great expectations resting on the new structure. I then followed AGARD through-out the decades, attending many meetings of the Structures and Materials Panel, until I became Panel Member in 1975 and, eventually, Panel Chairman during the period 1986-1988.

Derived from text

Aging (Materials); Mechanical Properties; Aerospace Vehicles; Damage; Fatigue (Materials)

20000052130 Knowledge Systems, Inc., Palmdale, CA USA

Automated Structural Optimization System (ASTROS) Damage Tolerance Module, Volume 2, User's Manual ***Final Report, 30 Sep. 1996 - 30 Sep. 1998***

Wang, L.; Atluri, S. N.; Feb. 1999; 55p; In English

Contract(s)/Grant(s): F33615-96-C-3215; AF Proj. 3005

Report No.(s): AD-A375881; AFRL-VA-WP-TR-1999-3069-V-2; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This report is part of the documentation that describes the complete development of an SBIR Phase II effort titled, "An ASTROS Compatible Computational Strategy for Evaluating the Aeroelastic Response, Buckling, and Integrity of Composite A/C". This report is one of three manuals that comprise the final documentation. The remaining reports consist of a User's Manual, Volume II, and an Interface Design Document, Volume III. The Automated STRuctural Optimization System (ASTROS) is a multidisciplinary computer program for the preliminary design of aircraft and spacecraft structures. It integrates structures, aerodynamics, controls and optimization to make possible interdisciplinary design. This report describes The work performed to enhance the capability of ASTROS to perform preliminary design optimization of metallic and composite material aircraft, based on damage tolerance requirements. It defines the SBIR technical objectives and gives a technical description of the Damage Tolerance models. The Automated global-local analyzer, the Buckling analysis of a composite with/without delamination, the Finite Element Alternating Method, Fatigue crack growth and optimization are also discussed. Finally a short description of interfacing with ASTROS is given.

DTIC

Design Analysis; Aircraft Design; Optimization; Spacecraft Structures; Tolerances (Mechanics)

20000052131 Knowledge Systems, Inc., Palmdale, CA USA

Automated Structural Optimization System (ASTROS) Damage Tolerance Module, Volume 1 ***Final Report, 30 Sep. 1996 - 30 Sep.1998***

Wang, L.; Atluri, S. N.; Feb. 1999; 63p; In English

Contract(s)/Grant(s): F33615-96-C-3215; AF Proj. 3005

Report No.(s): AD-A375882; AFRL-VA-WP-TR-1999-3069-V-1; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This report is part of the documentation that describes the complete development of an SBIR Phase II effort titled, "An ASTROS Compatible Computational Strategy for Evaluating the Aeroelastic Response, Buckling, and Integrity of Composite A/C". This report is one of three manuals that comprise the final documentation. The remaining reports consist of a User's Manual, Volume II, and an Interface Design Document, Volume III. The Automated STRuctural Optimization System (ASTROS) is a multidisciplinary computer program for the preliminary design of aircraft and spacecraft structures. It integrates structures, aerodynamics, controls and optimization to make possible interdisciplinary design. This report describes The work performed to enhance the capability of ASTROS to perform preliminary design optimization of metallic and composite material aircraft, based on damage tolerance requirements. It defines the SBIR technical objectives and gives a technical description of the Damage Tolerance models. The Automated global-local analyzer, the Buckling analysis of a composite with/without delamination, the Finite Element Alternating Method, Fatigue crack growth and optimization are also discussed. Finally a short description of interfacing with ASTROS is given.

DTIC

Optimization; Aircraft Design; Design Analysis; Spacecraft Structures

20000052504 NASA Langley Research Center, Hampton, VA USA

BMI Sandwich Wing Box Analysis and Test

Palm, Tod, Northrop Grumman Corp., USA; Mahler, Mary, Northrop Grumman Corp., USA; Shah, Chandu, Northrop Grumman Corp., USA; Rouse, Marshall, NASA Langley Research Center, USA; Bush, Harold, NASA Langley Research Center, USA; Wu, Chauncey, NASA Langley Research Center, USA; Small, William J., NASA Langley Research Center, USA; [2000]; 11p; In English; 4th; Structures, Structural Dynamics and Materials, 3-6 Apr. 2000, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Report No.(s): AIAA Paper 2000-1342; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A composite sandwich single bay wing box test article was developed by Northrop Grumman and tested recently at NASA Langley Research Center. The objectives for the wing box development effort were to provide a demonstration article for manufacturing scale up of structural concepts related to a high speed transport wing, and to validate the structural performance of the design. The box concept consisted of highly loaded composite sandwich wing skins, with moderately loaded composite sandwich spars. The dimensions of the box were chosen to represent a single bay of the main wing box, with a spar spacing of 30 inches, height of 20 inches constant depth, and length of 64 inches. The bismaleimide facesheet laminates and titanium honey-

comb core chosen for this task are high temperature materials able to sustain a 300F service temperature. The completed test article is shown in Figure 1. The tests at NASA Langley demonstrated the structures ability to sustain axial tension and compression loads in excess of 20,000 lb/in, and to maintain integrity in the thermal environment. Test procedures, analysis failure predictions, and test results are presented.
Author
Bismaleimide; Failure; Honeycomb Cores; Sandwich Structures; Structural Design; Titanium; Wings

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20000048495 National Aerospace Lab., Informatics Div., Amsterdam, Netherlands
Reliability, Maintainability and Safety Applied to a Real World Avionics Application
Kessler, E., National Aerospace Lab., Netherlands; vandeSluis, E., National Aerospace Lab., Netherlands; Jan. 1998; 28p; In English; European Safety and Reliability Conference, 17-19 Jun. 1998, Trondheim, Norway
Report No.(s): PB2000-104661; NLR-TP-98037; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

NLR currently is co-developing a civil avionics application that connects aircraft subsystems with the aircraft flight deck by means of modern digital data buses. It combines, controls, processes, and forwards the data between the subsystems and the flight deck. For this kind of application, certification is required by an independent, government-authorized third party. Guidelines for this certification are documented in the DO-178B standard: Software considerations in airborne systems and equipment certification. This paper describes practical experiences with DO-178B. The software development methodology used to guarantee the reliability, maintainability, safety, and certifiability of the product in a commercial environment is discussed. Requirements volatility and short time-to-market characterize the commercial reality.
NTIS
Avionics; Reliability Analysis; Maintainability; Flight Safety

20000048618 Analytic Sciences Corp., Reading, MA USA
Advanced Avionics Verification and Validation Phase 2 (AAV&V-II) ***Final Report, 1 Dec. 1994-1 Jan. 1999***
Cook, Robert E., Jr; Jan. 1999; 138p; In English
Contract(s)/Grant(s): F33615-92-D-1052; AF Proj. 3090
Report No.(s): AD-A375862; TR-06664-3; AFRL-IF-WP-TR-2000-1502; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

PROBLEM STATEMENT: As the complexity of software projects for embedded avionics applications increases, it becomes increasingly obvious that new innovative techniques will have to be used to help test those projects. Current methods of testing often require man-in-the-loop as well as extensive set up times. Often, the verification and validation of moderate software changes requires several weeks of man hours to accomplish. Advanced Avionics Verification and Validation (AAV&V) as an innovative technique: The AAV&V addresses the above problem by providing software developers and testers access to current testing a project technologies while investigating and proposing new techniques for validation and verification. Current software developers and testers can take advantage of an AAV&V Tool which sets on a powerful engineering workstation with open system architecture and gives them coverage and static analysis capability as well as documentation access and generation. Future software developers and testers will enjoy expansion of language options on the AAV&V tool's front end, as well as access to Formal Methods and Statistical techniques.
DTIC
Computer Programs; Avionics; Static Tests; Proving; Applications Programs (Computers); Workstations; Statistical Analysis

20000052120 NASA Dryden Flight Research Center, Edwards, CA USA

Development of a Flush Airdata Sensing System on a Sharp-Nosed Vehicle for Flight at Mach 3 to 8

Davis, Mark C., NASA Dryden Flight Research Center, USA; Pahle, Joseph W., NASA Dryden Flight Research Center, USA; White, John Terry, NASA Dryden Flight Research Center, USA; Marshall, Laurie A., NASA Dryden Flight Research Center, USA; Mashburn, Michael J., Micro Craft, Inc., USA; Franks, Rick, Sverdrup Technology, Inc., USA; January 2000; 18p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 522-51-54-00-50

Report No.(s): H-2390; AIAA Paper 2000-0504; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA Dryden Flight Research Center has developed a flush airdata sensing (FADS) system on a sharp-nosed, wedge-shaped vehicle. This paper details the design and calibration of a real-time angle-of-attack estimation scheme developed to meet the onboard airdata measurement requirements for a research vehicle equipped with a supersonic-combustion ramjet engine. The FADS system has been designed to perform in flights at Mach 3-8 and at -6 deg - 12 deg angle of attack. The description of the FADS architecture includes port layout, pneumatic design, and hardware integration. Predictive models of static and dynamic performance are compared with wind-tunnel results across the Mach and angle-of-attack range. Results indicate that static angle-of-attack accuracy and pneumatic lag can be adequately characterized and incorporated into a real-time algorithm.

Author

Air Data Systems; Wind Tunnel Tests; Wind Tunnel Models; Supersonic Wind Tunnels; Detection; Remote Sensing; Indicating Instruments

20000052481 National Aerospace Lab., Structures and Materials Div., Amsterdam, Netherlands

Automatic In-Flight Data Acquisition System for the RNLN Lynx Helicopter

Vergroesen, A. L.; Hoek, P. R.; Carati, F. J.; Dominicus, J. A. J. A.; ten Have, A. A.; Feb. 1998; 24p; In English; 19th; Aircraft Integrated Monitoring Systems AIMS98, 4-7 May 1998, Garmisch, Germany

Report No.(s): PB2000-103819; NLR-TP-98079; No Copyright; Avail: National Technical Information Service (NTIS)

As part of a maintenance cost reduction policy, the Royal Netherlands Navy (RNLN) recently funded the development, acquisition, certification, and the fleetwide installation of a unique multi-channel on-board data-acquisition system for its Lynx helicopter, called AIDA (Automatic In-flight Data Acquisition). This 17-channel AIDA system will generate valuable RNLN Lynx usage and loads data on the main rotor, engines, and airframe, thus enabling the RNLN to optimize Lynx maintenance until the NH90 comes into full service and the Lynx fleet will be phased out. Apart from a technical description of the AIDA system, the paper describes how a relatively small operator, such as the RNLN, performed the rather complex AIDA development program by itself.

NTIS

Data Acquisition; Automatic Control

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also 05 Aircraft Design, Testing and Performance and 06 Avionics and Aircraft Instrumentation.

20000044874 Boeing Commercial Airplane Co., Seattle, WA USA

Critical Stability and Control Issues in High-Speed Aerodynamics for the HSCT

Wilson, Douglas L., Boeing Commercial Airplane Co., USA; Princen, Norman H., McDonnell-Douglas Aerospace, USA; Harris, Oran C., Lockheed Martin Aeronautical Systems Co., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1215-1231; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The stability and control issues in high speed aerodynamics of most significance for the development of a viable HSCT are identified, and the status of the Ref. H configuration with respect to these issues is discussed. The interdependence between aerodynamic requirements and assumptions about airplane system functions such as Envelope Protection and Integrated Flight/Propulsion Control is highlighted. The conclusions presented draw on results from the Ref. H Assessment and Alternate Control Concepts Assessment performed under Configuration Aerodynamics Subtask 5 during 1995.

Author
Aircraft Stability; Aerodynamic Stability; Controllability; Aircraft Control; Flight Characteristics; Aerodynamic Configurations; Aerodynamics; Control Theory

20000044875 NASA Langley Research Center, Hampton, VA USA
An Experimental Database for Conventional and Alternate Control Concepts on the HSR 1.675% Reference H Model
McMillin, Naomi, NASA Langley Research Center, USA; Allen, Jerry, NASA Langley Research Center, USA; Erickson, Gary, NASA Langley Research Center, USA; Campbell, Jim, NASA Langley Research Center, USA; Mann, Mike, NASA Langley Research Center, USA; Kubiatko, Paul, McDonnell-Douglas Aerospace, USA; Yingling, David, McDonnell-Douglas Aerospace, USA; Mason, Charlie, Lockheed Martin Aerospace, USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1233-1251; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The objective was to experimentally evaluate the longitudinal and lateral-directional stability and control characteristics of the Reference H configuration at supersonic and transonic speeds. A series of conventional and alternate control devices were also evaluated at supersonic and transonic speeds. A database on the conventional and alternate control devices was to be created for use in the HSR program.
Derived from text
Lateral Stability; Longitudinal Stability; Directional Stability; Flight Control; Flight Characteristics

20000044876 NASA Langley Research Center, Hampton, VA USA
High Reynolds Number Effects on HSCT Stability and Control Characteristics
Elzey, Michael B., Boeing Co., USA; Owens, Lewis R., Jr., NASA Langley Research Center, USA; Wahls, Richard A., NASA Langley Research Center, USA; Wilson, Douglas L., Boeing Co., USA; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1253-1284; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Two wind tunnel tests during 1995 in the National Transonic Facility (NTF 070 and 073) served to define Reynolds number effects on longitudinal and lateral-directional stability and control. Testing was completed at both high lift and transonic conditions. The effect of Reynolds number on the total airplane configuration, horizontal and vertical tail effectiveness, forebody chine performance, rudder control and model aeroelastics was investigated. This paper will present pertinent stability and control results from these two test entries. Note that while model aeroelastic effects are examined in this presentation, no corrections for these effects have been made to the data.
Derived from text
Wind Tunnel Tests; Transonic Wind Tunnels; High Reynolds Number; Lateral Stability; Longitudinal Stability; Directional Stability; Controllability; Aircraft Control

20000045996 McDonnell-Douglas Aerospace, Long Beach, CA USA
Reference H Cycle 3 Stability, Control, and Flying Qualities Batch Assessments
Henderson, Dennis K., McDonnell-Douglas Aerospace, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 441-476; In English; See also 20000045988
Contract(s)/Grant(s): NAS1-20220; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This work is an update of the assessment completed in February of 1996, when a preliminary assessment report was issued for the Cycle 2B simulation model. The primary purpose of the final assessment was to re-evaluate each assessment against the flight control system (FCS) requirements document using the updated model. Only a limited number of final assessments were completed due to the close proximity of the release of the Langley model and the assessment deliverable date. The assessment used the nonlinear Cycle 3 simulation model because it combines nonlinear aeroelastic (quasi-static) aerodynamic with hinge moment and rate limited control surface deflections. Both Configuration Aerodynamics (Task 32) and Flight Controls (Task 36) were funded in 1996 to conduct the final stability and control assessments of the unaugmented Reference H configuration in FY96. Because the two tasks had similar output requirements, the work was divided such that Flight Controls would be responsible for the implementation and checkout of the simulation model and Configuration Aerodynamics for writing Madab ”script’ files, conducting the batch assessments and writing the assessment report. Additionally, Flight Controls was to investigate control surface allocations schemes different from the baseline Reference H in an effort to fulfill flying qualities criteria.
Derived from text
Flight Characteristics; Flight Control; Control Stability; Aerodynamic Configurations; Wind Tunnel Tests; Civil Aviation

20000046621 Simtec, Inc., Manassas, VA USA

Development and Validation of a Method of Evaluating the Effectiveness of Fighter Aircraft Simulation Force Cueing Devices ***Final Report, 3 Jun. 1996 - 1 Oct. 1997***

Heintzman, Richard J., Simtec, Inc., USA; Basinger, James D., Aeronautical Systems Div., USA; Middendorf, Matthew, Middendorf Technical Services, USA; May 1999; 58p; In English

Contract(s)/Grant(s): F33657-94-D-2253

Report No.(s): AD-A375328; ASC-TR-2000-5001; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This report documents the study which developed a method for evaluating the effectiveness of various force cueing devices a flight simulator. The concept developed included measurement of pilot behavior, performance, physiology and subjective pilot opinion to evaluate system effectiveness. As a part of this study, a trial evaluation was conducted in a laboratory fighter simulator to validate the evaluation method including identifying which pilot behaviors could best be measured and how the data could be collected and analyzed. Five task scenarios were flown by experienced fighter pilots with and without the presence of force cueing. Control activity and vehicle state data were analyzed to examine the effects of force cueing on pilot performance and control behavior. A debriefing questionnaire was used to elicit the pilot's subjective evaluation. The results of the trial evaluation indicated that the presence of force cueing improved pilot performance, control behavior, and made the simulator more operationally realistic.

DTIC

Pilot Performance; Flight Simulation; Flight Simulators; Cues

20000046788 NASA Dryden Flight Research Center, Edwards, CA USA

Emergency Control Aircraft System Using Thrust Modulation

Burken, John J., Inventor, NASA Dryden Flight Research Center, USA; Burcham, Frank W., Jr., Inventor, NASA Dryden Flight Research Center, USA; Mar. 21, 2000; 8p; In English

Patent Info.: Filed 1 Jul. 1997; NASA-Case-DRC-09600-7; US-Patent-6,041,273; US-Patent-Appl-SN-886656; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A digital longitudinal Aircraft Propulsion Control (APC system of a multiengine aircraft is provided by engine thrust modulation in response to comparing an input flightpath angle signal (gamma)c from a pilot thumbwheel. or an ILS system with a sensed flightpath angle y to produce an error signal (gamma)e that is then integrated (with reasonable limits) to generate a drift correction signal to be added to the error signal (gamma)e after first subtracting a lowpass filtered velocity signal Vel(sub f) for phugoid damping. The output error signal is multiplied by a constant to produce an aircraft thrust control signal ATC of suitable amplitude to drive a throttle servo for all engines. each of which includes its own full-authority digital engine control (FADEC) computer. An alternative APC system omits sensed flightpath angle feedback and instead controls the flightpath angle by feedback of the lowpass filtered velocity signal Vel(sub f) which also inherently provides phugoid damping. The feature of drift compensation is retained.

Official Gazette of the U.S. Patent and Trademark Office

Aircraft Control; Electronic Control; Engine Control; Error Signals; Feedback Control

20000048496 National Aerospace Lab., Amsterdam, Netherlands

Stochastic Simulation Procedure Compared to Deterministic Methods for PSD Gust Design Loads

Vink, W. J., National Aerospace Lab., Netherlands; May 1998; 94p; In English

Report No.(s): PB2000-104663; NLR-TP-98240; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

This report presents results of a study into PSD gust design load calculation methods. A Stochastic Simulation procedure based on the probability of exceeding the design level is developed. The probability of design level eccedence is equal for linear and nonlinear aircraft systems, so that the method produces the equivalent design conditions for linear and nonlinear systems. The Stochastic Simulation procedure is defined such, that estimations for the attained accuracy can be given. The results with Stochastic Simulation are compared to Deterministic PSD methods that have been studied in previous phases of this project. The MFB and the IDPSD methods produce results that approach the Stochastic Simulation results in some way, however there are still significant differences. The SG method results deviate considerably from the results of the other Deterministic methods as well as from Stochastic Simulation results.

NTIS

Power Spectra; Gust Loads; Stochastic Processes; Computerized Simulation; Research; Atmospheric Models

20000051546 TZN Forschungs- und Entwicklungszentrum Unterluess G.m.b.H., Germany

The Development of Multiple Supersonic Hot Gas Actuators for Missile Control

Meuer, Rosemarie, TZN Forschungs- und Entwicklungszentrum Unterluess G.m.b.H., Germany; Rosner, Norbert, TZN Forschungs- und Entwicklungszentrum Unterluess G.m.b.H., Germany; Schwenzer, Michael, TZN Forschungs- und Entwicklungszentrum Unterluess G.m.b.H., Germany; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 17-1 - 17-12; In English; See also 20000051537; Copyright Waived; Avail: CASI; A03, Hardcopy

A system of bistable or quasi-tristable fluidic jet reaction control elements could provide a reliable and effective means of missile control. A single solid fuelled motor is used to supply typically four fluidic elements, which are mounted at right angles to each other. A single bistable element, for example, delivers a fixed amount of thrust, which can be directed in one of two channels whose outlets axes are also at an angle of 901. The motor continuously supplies a thrust vector, which is switched from one canal to the other on the order of a few milliseconds using a relatively small jet pulse injected into the main flow. The jet injection can be easily controlled using two fast reacting magnetic valves. The present study involves experimental measurements of a fluidic actuator, which are compared to CFD results. The experiments were carried out in two stages. First, the experimental models were tested using gaseous nitrogen as the main flow. This not only allowed longer and repeated testing over the entire range of operating conditions, but also permitted visual access to the flowfield. The final short duration tests involve the use of a solid propellant to supply the main flow. After an optimisation of the element shape and the magnetic valves a complete jet reaction control system shall be demonstrated. The application of such a system is useful for guided high speed projectiles and missiles. The schedule to develop a demonstrator for a significantly enhanced existing system will be 3 years.

Author

High Temperature Gases; Actuators; Control Valves; Missile Control

20000051547 Thiokol Propulsion, Brigham City, UT USA

COMPACT THRUST VECTOR CONTROL FOR SMALL TACTICAL MOTORS

Wassom, Steven R., Thiokol Propulsion, USA; Behring, Michael A., Thiokol Propulsion, USA; Schroeder, Rich, Versatron Corp., USA; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 21-1 - 21-8; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

Focused efforts are underway to develop a control system for high-agility air-to-air missiles that combines conventional 4-fin aerodynamic control with dual movable nozzles for 3-axis control in all flight regimes. Packaging and performance will be demonstrated with a static test on a 7-inch diameter rocket motor. This system advance builds on 3 key technologies: miniature temperature-insensitive flexible bearings (flexbearings), a compact electromechanical actuation system, and a unique mechanical linkage that couples the motions of the nozzles and aerodynamic surfaces. Two separate nozzle/blast tube assemblies integrated into a common motor closure allow for the most efficient packaging of the actuation system. The estimated improvements compared to a current production type 3-axis control system are as follows: length, 49%; weight, 29%; delivered impulse, 16%; mass fraction, 16%; and cost, is greater than 50%. A new 3.5-year program funded through the IHPRPT process is furthering development efforts.

Author

Thrust Vector Control; Air to Air Missiles; Space Weapons; Missile Control; Rocket Engines

20000052124 NASA Langley Research Center, Hampton, VA USA

Fin Buffeting Features of an Early F-22 Model

Moses, Robert W., NASA Langley Research Center, USA; Huttsell, Lawrence, Air Force Research Lab., USA; [2000]; 10p; In English; 41st; Structures, Structural Dynamics, and Materials, 3-6 Apr. 2000, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-1695; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Fin buffeting is an aeroelastic phenomenon encountered by high performance aircraft, especially those with twin vertical tails that must operate at high angles of attack. This buffeting is a concern from fatigue and inspection points of view. to date, the buffet (unsteady pressures) and buffeting (structural response) characteristics of the F-15 and F/A-18 fins have been studied extensively using flow visualization, flow velocity measurements, pressure transducers, and response gages. by means of windtunnel and flight tests of the F-15 and F/A-18, this phenomenon is well studied to the point that buffet loads can be estimated and fatigue life can he increased by structural enhancements to these airframes. However, prior to the present research, data was not available outside the F-22 program regarding fin buffeting on the F-22 configuration. During a test in the Langley Transonic Dynamics Tunnel, flow visualization and unsteady fin surface pressures were recorded for a 13.3%-scale F-22 model at high angles of attack

for the purpose of comparing with results available for similar aircraft configurations. Details of this test and fin buffeting are presented herein.
Author
Buffeting; Aeroelasticity; Aircraft Configurations; Angle of Attack; Leading Edges; Rudders; Fins; Tail Assemblies; Leading Edge Flaps

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see 03 Air Transportation and Safety. For astronautical facilities see 14 Ground Support Systems and Facilities (Space).

20000046627 Directorate General of Civil Aviation, The Hague, Netherlands
The Integrated Airport Competition Model, 1998
Veldhuis, J., Directorate General of Civil Aviation, Netherlands; Essers, I., Directorate General of Civil Aviation, Netherlands; Bakker, D., Hague Consulting Group, Netherlands; Cohn, N., Hague Consulting Group, Netherlands; Kroes, E., Hague Consulting Group, Netherlands; Journal of Air Transportation World Wide; 1999; ISSN 1093-8826; Volume 4, No. 2, pp. 100-120; In English; Copyright; Avail: Issuing Activity

This paper addresses recent model development by the Directorate General of Civil Aviation (DGCA) and Hague Consulting Group (HCG) concerning long-distance travel, Long-distance travel demand is growing very quickly and raising a great deal of economic and policy issues. There is increasing competition among the main Western European airports, and smaller, regional airports are fighting for market share. New modes of transport, such as high speed rail, arc also coming into the picture and affect the mode split for medium distance transport within Europe. Developments such as these are demanding the attention of policy makers and a tool is required for their analysis. For DGCA, Hague Consulting Group has developed a model system to provide answers to the policy questions posed by these expected trends, and to identify areas where policy makers can influence the traveller choices. The development of this model system, the Integrated Airport Competition Model/Integral Luchthaven Competitive Model (ILCM), began in 1992. Since that time the sub-models, input data and user interface have been expanded, updated and improved. HCG and DGCA have transformed the ILCM from a prototype into an operational forecasting tool.
Author
Airports; Competition; Models; Forecasting; Economics

20000046630 University of Southern Illinois, Carbondale, IL USA
Planning for New Primary Airports in the USA: A Survey of Metropolitan Planning Organizations
NewMyer, David A., University of Southern Illinois, USA; Journal of Air Transportation World Wide; 1999; ISSN 1093-8826; Volume 4, No. 2, pp. 49-64; In English; Copyright; Avail: Issuing Activity

Airport congestion at primary airports in major metropolitan areas was analyzed in a report prepared by the Transportation Research Board (TRB) in 1990. Taking the top twenty-three most congested airports from this study, a questionnaire was prepared and sent to the metropolitan planning organizations (MPOs) for twenty of the twenty-three metropolitan areas represented in the TRB study, The questionnaire focused on the role of the MPOs in planning for new primary airports in the USA, including questions about the status of the most recent MPO airport system plan, whether or not the latest plan recommends a new primary airport, and whether or not any other entities in the MPO areas are recommending new primary airports. The results indicated that 44.4 percent of the eighteen respondent MPOs have airport system plans that are five years old or older. Also, only two of the respondent MPOs have recommended a new primary airport in their latest regional airport system plan and only one of these two is a common recommendation in the Federal Aviation Administration's National Plan of Integrated Airport System.
Author
Management; Planning; Airports; Surveys

20000048411 NASA Marshall Space Flight Center, Huntsville, AL USA
Marshall Space Flight Center High Speed Turbopump Bearing Test Rig
Gibson, Howard, NASA Marshall Space Flight Center, USA; Moore, Chip, NASA Marshall Space Flight Center, USA; Thom, Robert, NASA Marshall Space Flight Center, USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 331-342; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Marshall Space Flight Center has a unique test rig that is used to test and develop rolling element bearings used in high-speed cryogenic turbopumps. The tester is unique in that it uses liquid hydrogen as the coolant for the bearings. This test rig can simulate speeds and loads experienced in the Space Shuttle Main Engine turbopumps. With internal modifications, the tester can be used for evaluating fluid film, hydrostatic, and foil bearing designs. At the present time, the test rig is configured to run two ball bearings or a ball and roller bearing, both with a hydrostatic bearing. The rig is being used to evaluate the lifetimes of hybrid bearings with silicon nitride rolling elements and steel races.
Author
High Speed; Turbine Pumps; Ball Bearings; Roller Bearings; Inspection

20000051541 Instituto Nacional de Tecnica Aeroespacial, Huelva, Spain
EQUIPMENT AND PROCEDURES FOR TEST RANGE OPERATION IN MISSILE EVALUATION
Blanco, Juan M., Instituto Nacional de Tecnica Aeroespacial, Spain; Mulero, Manuel, Instituto Nacional de Tecnica Aeroespacial, Spain; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 4-1 - 4-10; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

Today's technology provides design engineers with sophisticated hardware and software tools that will help them to develop weapon systems from concept and feasibility early phases to prototype design and testing phases without almost having the need to see the "ultimate truth" of a real firing. Even for end-users. simulators systems help them in the severe requirement of being trained and ready to "play" on a daily basis. At the very end both designers and armed forces, will have to test under real firing, the performance of the weapon system and the capability to operate it in a near-to-real scenario. This is where Test Ranges get into play. This paper will introduce us in several aspects of the implementation of customer test requirements through the different phases that the test will go through. While prototype testing and tactical exercises seems to be of a complete different nature in their objectives, most of the Test Range activities, equipment, and procedures will be valid for both types of users. The approach selected for this paper is not only a purely "cold" description of equipment specifications but to show also some of the decision-making processes on which the customer and the Test Range has to agree to suit test requirements to Test Range capabilities. Cost analysis, although obviously relevant is not part of this study, while cost-effectiveness is.
Derived from text
Computer Programs; Computers; Equipment Specifications; Missile Ranges; Ballistic Ranges; Missiles

20000052127 Orincon Corp., La Jolla, CA USA
Airfield Ground Safety ***Final Report, Oct. 1997 - Nov. 1999***
Petrescu, Jon; Mar. 2000; 44p; In English
Contract(s)/Grant(s): F30602-97-C-0353; AF Proj. 4748
Report No.(s): AD-A375863; OC-98-4311-U-0300; AFRL-IF-RS-TR-2000-16; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document is the final report for the Airfield Ground Safety (AGS) program under Air Force Research Laboratory-Rome contract number F30602-97-C-0333. The system developed under AGS, called the Ground Safety Tracking and Reporting System, uses multisensor data fusion from in-pavement inductive loop sensors to address a critical problem affecting out nation's airports: runway incursions. GSTARS is an effective, low-cost solution that provides aircraft and ground vehicle detection, classification (including aircraft type), and origin/destination tracking in all weather and visibility conditions. The system is currently installed at MacDill Air Force Base and provides increased situation awareness and tracking of ground traffic to air traffic controllers in the Tower, and to base Operations and Base Command. GSTARS is based on inductive loop technology coupled with advanced signal processing and predictive networking techniques that provide airport surface traffic surveillance.
DTIC
Safety; Tracking (Position); Airports

12
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see categories 13 through 20. For extraterrestrial exploration, see 91 Lunar and Planetary Science and Exploration.

20000050473 NASA Marshall Space Flight Center, Huntsville, AL USA
Rapid Production of Composite Prototype Hardware ***Final Report***
DeLay, T. K., NASA Marshall Space Flight Center, USA; March 2000; 26p; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj. 96-02
Report No.(s): NASA/TM-2000-210128; M-974; NAS 1.26:210128; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this research was to provide a mechanism to cost-effectively produce composite hardware prototypes. The task was to take a hands-on approach to developing new technologies that could benefit multiple future programs.
Author
Research; Cost Effectiveness; Hardware; Composite Materials; Prototypes; Procedures

20000052465 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Iterative Repair Planning for Spacecraft Operations Using the Aspen System
Rabideau, G., Jet Propulsion Lab., California Inst. of Tech., USA; Knight, R., Jet Propulsion Lab., California Inst. of Tech., USA; Chien, S., Jet Propulsion Lab., California Inst. of Tech., USA; Fukunaga, A., Jet Propulsion Lab., California Inst. of Tech., USA; Govindjee, A., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 4p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This paper describes the Automated Scheduling and Planning Environment (ASPEN). ASPEN encodes complex spacecraft knowledge of operability constraints, flight rules, spacecraft hardware, science experiments and operations procedures to allow for automated generation of low level spacecraft sequences. Using a technique called iterative repair, ASPEN classifies constraint violations (i.e., conflicts) and attempts to repair each by performing a planning or scheduling operation. It must reason about which conflict to resolve first and what repair method to try for the given conflict. ASPEN is currently being utilized in the development of automated planner/scheduler systems for several spacecraft, including the UFO-1 naval communications satellite and the Citizen Explorer (CX1) satellite, as well as for planetary rover operations and antenna ground systems automation. This paper focuses on the algorithm and search strategies employed by ASPEN to resolve spacecraft operations constraints, as well as the data structures for representing these constraints.
Author
Automatic Control; Maintenance; Planetary Surfaces; Planning; Roving Vehicles; Spaceborne Experiments

13
ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

20000052469 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Impact of Eccentricity on East-West Stationkeeping for GPS Class of Orbits
Ely, Todd A., Jet Propulsion Lab., California Inst. of Tech., USA; [1999]; 7p; In English; Astrodynamics, 16-18 Aug. 1999, Girdwood, AK, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

There exists a strong relationship between eccentricity and the potential for a repeating groundtrack orbit to exhibit chaotic motion. This is true at all values of eccentricity, but, perhaps most dramatic, is that it is true even for orbits that are nearly circular. These complex motions can have a significant impact on the east-west stationkeeping process for maintaining the repeating groundtrack property of a commensurate orbit. Ely and Howell have shown that traditional stationkeeping (SK) methods are unable to maintain a repeating groundtrack in the presence of complex dynamics, such as with chaotic motion. They developed an alternate SK method that is able to maintain a repeating groundtrack for eccentric, commensurate orbits. The focus of the current study is to investigate orbits with characteristics that are similar to GPS satellites except with modestly larger eccentricities. It will be shown that at eccentricities larger than approx. .01 the chaotic regions become significant, and the need arises for a robust

stationkeeping approach, such as developed in. FurtheRmore, the investigation will reveal that the influence of luni-solar perturbations contributes to the growth of eccentricity, thus increasing the probability of encountering chaotic motion during a typical satellite lifetime.
Author
Eccentric Orbits; Global Positioning System; Ground Tracks; Stationkeeping

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also 18 Spacecraft Design, Testing, and Performance; and 20 Spacecraft Propulsion and Power.

20000046620 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
National Oceanic and Atmospheric Administration: National Weather Service Modernization and Weather Satellite Program
Willemssen, Joel C., General Accounting Office, USA; Mar. 29, 2000; 13p; In English; Testimony Before the Subcommittee on Energy and Environment, Committee on Science, House of Representatives.
Report No.(s): AD-A375325; GAO/T-AIMD-00-86; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We appreciate the opportunity to join in today's hearing to discuss our work in two areas that are the responsibility of the National Oceanic and Atmospheric Administration (NOAA). At your request, we will discuss the status of the National Weather Service (NWS) systems modernization and the National Environmental Satellite, Data, and Information Service's Geostationary Operational Environmental Satellite (GOES) program. In brief, although NWS is nearing completion of its systems modernization effort, it still faces important challenges. During the coming year, NWS plans to finish commissioning' the Advanced Weather Interactive Processing System (AWIPS), the final system of the modernization. At the same time, NWS is developing additional AWIPS system capabilities to be implemented in the future. According to NWS, these additional capabilities are needed for AWIPS to improve radar and satellite data processing and to provide weather forecasters with a full range of interactive forecasting techniques. The agency is also developing a systems architecture to provide a blueprint for future systems acquisitions. Regarding the GOES program, NOAA continues to deploy weather satellites to ensure adequate satellite coverage. However, because of unexpected problems, satellite coverage is currently at risk and will remain so until a new satellite is successfully launched. NOAA plans to launch the new satellite in May 2000. to ensure continued satellite coverage beyond the current satellite series, NOAA is planning for the program's near- and long-term future. The approach we used to perform this work-our objectives, scope, and methodology-are provided in appendix I.
DTIC
Meteorological Satellites; Weather Forecasting; Meteorological Services; Weather Stations

20000052448 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Space Station: Russian Compliance With Safety Requirements
Li, Allen; Mar. 16, 2000; 10p; In English; Testimony Before the Subcommittee on Space and Aeronautics, Committee on Science, House of Represntatives.
Report No.(s): AD-A375270; GAO/T-NSIAD-00-128; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This report discusses our ongoing work on the National Aeronautics and Space Administration's (NASA) International Space Station. We are currently responding to a request from the Committee Chairman to review Russian compliance with space station safety requirements. We plan to finalize our work and report on this issue next month. Today, we will address (1) significant areas where the Russian-built Zarya and Service Module do not comply with safety requirements, (2) NASA's review and approval of noncompliances and (3) whether NASA was due any compensation from the Zarya contractor for noncompliance or performance problems. NASA invited Russia to participate in the International Space Station program in 1993 with the expectation that Russian involvement would reduce the cost, speed up the schedule, and increase the usefulness of the space station. The Russian-built Zarya and Service Module are critical to the early stages of the space station's assembly. The Zarya module, launched by Russia in November 1998, provides the initial propulsion and guidance functions for the space station. Zarya was funded by NASA and is therefore considered a U.S. element of the space station. The Service Module, whose launch has been delayed until at least July 2000, will provide living quarters, life support systems, and guidance functions after docking with Zarya. Russia is funding, building, and launching the Service Module as part of its contribution to the space station. Russia also plans to contribute Progress resup-

ply vehicles, Soyuz crew transfer and emergency return vehicles, a power platform, docking and stowage modules, and research modules.
DTIC
International Space Station; Service Modules; Soyuz Spacecraft; Spacecraft Docking; Zarya Control Module; U.S.S.R. Space Program; Spacecraft Docking Modules

16
SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information, see also 03 Air Transportation and Safety and 15 Launch Vehicles and Launch Vehicles, and 18 Spacecraft Design, Testing and Performance. For space suits, see 54 Man/System Technology and Life Support.

20000052202 NASA Johnson Space Center, Houston, TX USA
STS-101 Crew Activity Report Flight Day 02 Highlights
May 20, 2000; In English; Videotape: 13 min., 51 sec. playing time, in color with sound
Report No.(s): BRF-1422B; NONP-NASA-VT-2000065770; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary mission objective for STS-101 was to deliver supplies to the International Space Station, perform a space walk, and reboost the station from 230 statute miles to 250 statute miles. The commander of this mission was, James D. Haslsell. The crew was Scott J. Horowitz, the pilot, and mission specialists Mary Ellen Weber, Jeffrey N. Williams, James S. Voss, Susan J. Helms, and Yuri Vladimirovich Usachev. This videotape shows the activities of the second day of the flight. On this day the shuttle crew checked the equipment in preparation for rendezvous with the International Space Station. This video shows the astronauts entering the SpaceHab, where the supplies bound for the space station are stored. There are also views of the robotic arm, which will be used during the spacewalk to maneuver Williams and Voss between Atlantis and the station.
CASI
International Space Station; Robot Arms; Space Shuttle Orbiters; Space Transportation System

20000052455 NASA Johnson Space Center, Houston, TX USA
STS-101: CAR / Flight Day 03 Highlights
May 21, 2000; In English; Videotape: 12 min. 32 sec. playing time, in color, with sound
Report No.(s): BRF-1422C; NONP-NASA-VT-2000065772; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary mission objective for STS-101 was to deliver supplies to the International Space Station, perform a space walk, and reboost the station from 230 statute miles to 250 statute miles. The commander of this mission was, James D. Haslsell. The crew was Scott J. Horowitz, the pilot, and mission specialists Mary Ellen Weber, Jeffrey N. Williams, James S. Voss, Susan J. Helms, and Yuri Vladimirovich Usachev. This videotape shows the activities of the third day of the flight. On this day the shuttle rendezvoused and docked with the station. The videotape shows the rendezvous and the docking maneuver, and some of the crew activities in the shuttle.
CASI
International Space Station; Orbital Rendezvous; Space Transportation System; Spacecraft Docking

20000052456 NASA Johnson Space Center, Houston, TX USA
STS-101: Flight Day Highlights / CAR
May 19, 2000; In English; Videotape: 17 min. 12 sec. playing time, in color, with sound
Report No.(s): BRF-1422A; NONP-NASA-VT-2000065771; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

The primary mission objective for STS-101 was to deliver supplies to the International Space Station, perform a space walk, and reboost the station from 230 statute miles to 250 statute miles. The commander of this mission was, James D. Halsell. The crew was Scott J. Horowitz, the pilot, and mission specialists Mary Ellen Weber, Jeffrey N. Williams, James S. Voss, Susan J. Helms, and Yuri Vladimirovich Usachev. This videotape shows the launch of STS-101, beginning with the pre-flight breakfast and the crew's introduction. The videotape next shows a pre-dawn view of the orbiter waiting the crew's arrival. The crew is shown getting into their space suits and then climbing onboard the shuttle. In this videotape we are shown a few of the crew getting into their places onboard the shuttle. We are also shown the newly designed "glass cockpit", which gives the pilot and the commander

better views and are told that this is the first flight of the shuttle with the new design. After the hatch is closed, we see the shuttle launch into the night, followed by the Solid Rocket Boosters (SRB) separation.
Author
Launching; Space Transportation System Flights; Spacecraft Launching; Spacecrews; Space Shuttles; Crew Procedures (Preflight); Preflight Operations

20000052492 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-101: Crew Activity Report CAR/Flight Day 04 Highlights
May 22, 2000; In English; Videotape: 20 min. 34 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000068746; BRF-1422D; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On this fourth day of the STS-101 Atlantis mission, the flight crew, Commander James D. Halsell Jr., Pilot Scott J. Horowitz, and Mission Specialists Mary Ellen Weber, Jeffrey N. Williams, James S. Voss, Susan J. Helms, and Yuri Vladimirovich Usachev are seen performing final preparations for the scheduled space walk. Horowitz, Williams and Voss are seen in the mid-deck before the space walk. Horowitz and Weber are also seen in the flight deck, powering-up the robot-arm. During the space walk Voss is seen checking the American Cargo Crane-Orbital Replacement Unit Transfer Device. Voss and Williams are shown securing the American-built crane that was installed on the station last year. They are seen as they install the final parts (boom extension) of a Russian-built crane on the station. Voss and Williams are also shown as they replace a faulty antenna for one of the station's communications systems on the Unity Module, and install several handrails and a camera cable on the station's exterior.
CASI
International Space Station; Spacecraft Docking; Extravehicular Activity; Unity Connecting Module

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information, see also 04 Aircraft Communications and Navigation and 32 Communications and Radar.

20000048274 Brigham Young Univ., Dept. of Electrical and Computer Engineering, Provo, UT USA
A Comprehensive Investigation of Advanced Range Telemetry ***Final Report, 1 Dec. 1997 - 31 Oct. 1998***
Rice, Michael; Nov. 29, 1999; 82p; In English
Contract(s)/Grant(s): F49620-98-1-0103
Report No.(s): AD-A375937; AFRL-SR-BL-TR-00-0092; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

This report summarizes the results of the initial work on channel characterization for the Advanced Range Telemetry (ARTM) program. Data collected from channel sounding flights was used to determine the number, complex gain, and delays of multipath propagation paths that distort the received signal in common aeronautical telemetry scenarios. These parameters were estimated using frequency domain curve fitting techniques to describe significant number of multipath fade events recorded during channel sounding flights. The results were compared with time-domain cross correlation estimation techniques where applicable and found to be consistent. The physical geometry of the multipath environment was also analyzed where it was shown that the multipath delays derived from the data analysis were consistent with those that could have been produced by the transmitter/receiver geometry. Both static channel models and dynamic channel models were evaluated. The static channel model consists of three propagation paths: a line-of-sight path; a strong specular reflection with an amplitude greater than 50% that of the line-of-sight path and delay 30 to 70 nanoseconds; and a weaker specular reflection with an amplitude less than 50% that of the line-of-sight path and a delay 175 to 325 nanoseconds. The dynamic channel model depends on the scattering function and Doppler spectrum. These functions were estimated from the data where it was found that the spatial sampling rate on the channel sounding flights to date was not sufficiently fast to capture the frequency content associated with the changes in the channel impulse response. The resulting Doppler spectra were obviously aliased.
DTIC
Telemetry; Data Transmission

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see 54 Man/System Technology and Life Support. For related information, see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation and Safety.

20000048384 Sener Ingenieria y Sistemas S.A., Spain
Low-Cost Ejection Mechanisms for Protective Covers on Meteosat Second Generation
Ortega, J., Sener Ingenieria y Sistemas S.A., Spain; Quintana, F., Sener Ingenieria y Sistemas S.A., Spain; Ybarra, G., Sener Ingenieria y Sistemas S.A., Spain; 34th Aerospace Mechanisms Symposium; May 2000, pp. 39-50; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Two covers protect the sensitive surfaces of the MSG (Meteosat Second Generation) satellite against possible contaminants. Once the peril of contamination ceases, the covers must be jettisoned, allowing the satellite to operate. Their failure to provide isolation or the failure of their jettisoning leads to mission failure. The mechanisms responsible for the ejection must face severe requirements: only one pyrotechnic is allowed for the baffle cover, the acoustic environment reaches levels of 146 dB, and the allowed mass is very low. These requirements have led to the use of preloaded supports such as the ”flexible releasable hinge”, which is capable of supporting the cover and releasing it passively without the use of telecommand.
Author
Low Cost; Protectors; Meteosat Satellite; Contaminants; Contamination

20000048386 Lockheed Martin Space Systems Co., Sunnyvale, CA USA
Lessons Learned from the Manufacturing and Test of the International Space Station Drive Lock Assembly
Allmon, Curtis, Lockheed Martin Space Systems Co., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 61-73; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Drive Lock Assembly (DLA) is a part of the Solar Alpha Rotary Joint (SARJ) and functions as the primary drive for the joint and doubles as a locking mechanism. The SARJ DLA (SDLA) consists of over 200 piece parts that when fully assembled, form a unique and complex mechanism. Through the course of manufacturing and test, many interesting problems were encountered, producing the need for a significant amount of troubleshooting, and in the end, leading to many important lessons learned. The focus of the paper will be these lessons learned, however, in order to familiarize the reader with the assembly, some time will be spent addressing the main design features and the design evolution.
Author
Space Manufacturing; Space Industrialization; Space Commercialization; Spacecraft Structures; Space Station Structures; Space Erectable Structures; International Space Station

20000048387 Moog, Inc., East Aurora, NY USA
Development of an Automated Bolt Driver for the Space Station Truss Assembly
Meinhold, Richard, Moog, Inc., USA; Seidner, Ken, Boeing Co., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 75-88; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Moog Space Station Bolt Motor Actuator (BMA) is a rotary actuator comprised of a brushless DC motor, controller, and 120V DC-DC power supply coupled to a four-pass planetary gear system and containing a manual override (MO) system. This paper discusses the new technologies developed and lessons learned during the BMA development. These include the use of a relatively new material, Pyrowear 675, a new Vapor Deposition coating, WC/C, and a hard-on-hard (HOH) worm drive system delivering 135.6 N.m (1200 in.lb) of torque (the primary focus of this paper).
Author
Bolts; Bolted Joints; Torque Motors; Actuators; Space Station Structures; Trusses

20000048389 NASA Johnson Space Center, Houston, TX USA
An Energy Absorber for the International Space Station
Wilkes, Bob, Lockheed Martin Space Operations, USA; Laurence, Lora, NASA Johnson Space Center, USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 103-116; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The energy absorber described herein is similar in size and shape to an automotive shock absorber, requiring a constant, high load to compress over the stroke, and self-resetting with a small load. The differences in these loads over the stroke represent the

energy absorbed by the device, which is dissipated as friction. This paper describes the evolution of the energy absorber, presents the results of testing performed, and shows the sensitivity of this device to several key design variables.
Author
Energy Absorption; International Space Station; Design Analysis; Mechanical Devices; Control Equipment

20000048393 Naval Research Lab., Washington, DC USA
A Separation System Solution for the Interim Control Module
Whalen, Brian, Naval Research Lab., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 143-149; In English; See also 20000048380; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The Interim Control Module (ICM) is a propulsion and attitude control platform for the International Space Station (ISS) built by the US Naval Research Laboratory (NRL). ICM is delivered to ISS via the Space Shuttle, where it is separated from its structural support canister and moved into docking position using the Shuttle Remote Manipulator System (SRMS). The Pin Extraction Mechanism (PEM) is one of the mechanisms that help ensure the separation of electrical connectors and prevents re-engagement of the pins and sockets. This paper describes the ICM separation system, the PEM and operational details.
Author
Separators; Control Equipment; Propulsion; Attitude Control; International Space Station

20000051525 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Common High Performance Computing Software Support Initiative (CHSSI) Computational Fluid Dynamics (CFD)-6 Project. ARL Block-Structured Gridding Zonal Navier-Stokes Flow (ZNSFLOW) Solver Software ***Final Report***
Edge, Harris L.; Sahu, Jubaraj; Sturek, Walter B.; Pressel, Daniel M.; Heavey, Karen R.; Feb. 2000; 77p; In English; Prepared in collaboration with Raytheon Systems Co. and Rice Univ.
Report No.(s): AD-A375601; ARL-TR-2084; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report presents an overview of the software developed under the common high performance computing software support initiative (CHSSI), computational fluid dynamics (CFD)-6 project. Under the project, a zonal Navier-Stokes flow solver tested and validated via years of productive research at the U.S. Army Research Laboratory was rewritten for scalable parallel performance on both shared memory and distributed memory high performance computers. At the same time, a graphical user interface (GUI) was developed to help the user set up the problem, provide real-time visualization, and execute the solver. The GUI is not just an input interface but provides an environment for the systematic, coherent execution of the solver, thus making it a more useful, quicker and easier application tool for engineers. Also part of the CHSSI project is a demonstration of the developed software on complex applications of interest to the Department of Defense (DoD). Results from computations of 10 brilliant antitank (BAT) submunitions simultaneously ejecting from a single Army tactical missile and a guided multiple launch rocket system missile are discussed. Experimental data were available for comparison with the BAT computations. The CFD computations and the experimental data show good agreement and serve as validation for the accuracy of the solver. The software has been written with large memory requirements and scalability in mind. For a grid size of 59 million points, the performance achieved on an Silicon Graphics, Incorporated, Origin 2000 with 96 processors is 18 times the performance that could be achieved via a computer with the processing speed of a single Cray C-90 Processor.
DTIC
Software Development Tools; Software Engineering; Computer Programs; Computational Fluid Dynamics; Navier-Stokes Equation

20000052204 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
The Design of a Fault-Tolerant COTS-Based Bus Architecture for Space Applications
Chau, Savio N., Jet Propulsion Lab., California Inst. of Tech., USA; Alkalai, Leon, Jet Propulsion Lab., California Inst. of Tech., USA; Tai, Ann T., IA Tech, Inc., USA; [2000]; 11p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The high-performance, scalability and miniaturization requirements together with the power, mass and cost constraints mandate the use of commercial-off-the-shelf (COTS) components and standards in the X2000 avionics system architecture for deep-space missions. In this paper, we report our experiences and findings on the design of an IEEE 1394 compliant fault-tolerant COTS-based bus architecture. While the COTS standard IEEE 1394 adequately supports power management, high performance and scalability, its topological criteria impose restrictions on fault tolerance realization. to circumvent the difficulties, we derive a ”stack-tree” topology that not only complies with the IEEE 1394 standard but also facilitates fault tolerance realization in a spaceborne system with limited dedicated resource redundancies. Moreover, by exploiting pertinent standard features of the 1394

interface which are not purposely designed for fault tolerance, we devise a comprehensive set of fault detection mechanisms to support the fault-tolerant bus architecture.
Author
Fault Tolerance; Failure Analysis; Fault Detection; System Failures; Systems Health Monitoring

20000052453 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Using Iterative Repair to Increase the Responsiveness of Planning and Scheduling for Autonomous Spacecraft
Chien, Steve, Jet Propulsion Lab., California Inst. of Tech., USA; Knight, Russell, Jet Propulsion Lab., California Inst. of Tech., USA; Stechert, Andre, Jet Propulsion Lab., California Inst. of Tech., USA; Sherwood, Rob, Jet Propulsion Lab., California Inst. of Tech., USA; Rabideau, Gregg, Jet Propulsion Lab., California Inst. of Tech., USA; [1998]; 8p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An autonomous spacecraft must balance long-term and short-term considerations. It must perform purposeful activities that ensure long-term science and engineering goals are achieved and ensure that it maintains positive resource margins. This requires planning in advance to avoid a series of shortsighted decisions that can lead to failure, However, it must also respond in a timely fashion to a somewhat dynamic and unpredictable environment. Thus, spacecraft plans must often be modified due to fortuitous events such as early completion of observations and setbacks such as failure to acquire a guidestar for a science observation. This paper describes the use of iterative repair to support continuous modification and updating of a current working plan in light of changing operating context.
Author
Autonomy; Maintenance; Scheduling; Task Planning (Robotics); Unmanned Spacecraft; Interplanetary Spacecraft; Adaptive Control; Space Missions

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information, see also 06 Aircraft Instrumentation and Avionics; For spaceborne instruments not integral to the vehicle itself see 35 Instrumentation and Photography; For spaceborne telescopes and other astronomical instruments see 89 Astronomy, Instrumentation and Photography; For spaceborne telescopes and other astronomical instruments see 89 Astronomy.

20000052451 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Terrestrial Applications of a Nano-g Accelerometer
Hartley, Frank T., Jet Propulsion Lab., California Inst. of Tech., USA; [1996]; 4p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The ultra-sensitive accelerometer, developed for NASA to monitor the microgravity environments of Space Shuttle, five orbiters and Space Station, needed to measure accelerations up to 10 mg with an absolute accuracy of 10 nano-g (10(exp -8)g) for at least two orbits (10(exp 4) seconds) to resolve accelerations associated with orbital drag. Also, the accelerometers needed to have less than 10(exp -9) F.S. off-axis sensitivity; to be thermally and magnetically inert; to be immune to quiescent shock, and to have an in-situ calibration capability. Multi-axis compact seismometers, designs that have twelve decades of dynamic range will be described. Density profilometers, precision gradiometers, gyros and vibration isolation designs and applications will be discussed. Finally, examples of transformations of the accelerometer into sensitive anemometers and imaging spectrometers will be presented.
Author
Accelerometers; Fabrication; Microgravity; Space Shuttle Orbiters; Sensitivity; Seismographs; Drag; Calibrating

20
SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also 07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations; and 44 Energy Production and Conversion.

20000048817 Department of Defense, Office of the Inspector General, Arlington, VA USA
Acquisition of the Minuteman III Propulsion Replacement Program
Mar. 01, 2000; 33p; In English
Report No.(s): AD-A375716; IG/DOD-D-2000-092; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Minuteman III is a ballistic missile weapon system of intercontinental range. The purpose of the Propulsion Replacement Program (the program) is to extend the service life of the Minuteman III weapon system by remanufacturing and replacing the three solid rocket stages of its propulsion system before age-out occurs. The Air Force initiated the program in response to national guidance for strategic deterrence and defense in the DoD Planning Guidance for maintaining a strategic nuclear force. The program also responds to guidance in the 1992 National Military Strategy to continue to maintain a TRIAD to deter the threat of nuclear aggression. The Minuteman III weapon system will eventually become the only intercontinental ballistic missile component of the strategic TRIAD. The Intercontinental Ballistic Missile System Program Office (System Program Office) estimates that program research and development will cost about $331 million and that procurement will cost about $1.8 billion. The audit objective was to evaluate the overall management of the Air Force Minuteman III Propulsion Replacement Program. Because the program is in the engineering and manufacturing development acquisition phase, our objective was to determine whether management was cost-effectively developing and readying the program for low-rate initial production. In addition, we evaluated the management control program as it related to our audit objective.
DTIC
Intercontinental Ballistic Missiles; Rocket Engines; Acquisition; Manufacturing; Minuteman Icbm; Product Development; Propulsion

20000051537 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France
Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems ***Les Petits Moteurs-Fusees et Generateurs de Gaz pour Missiles Tires du Sol, de Plates-Formes Aeriennes ou de Navires***
April 2000; 423p; In English; In French, 19-23 Apr. 1999, Corfu, Greece; See also 20000051538 through 20000051564; CD-ROM contains full text document in PDF format
Report No.(s): RTO-MP-23; AC/323(AVT)TP/11; Copyright Waived; Avail: CASI; A18, Hardcopy; A04, Microfiche; C01, CD-ROM

The symposium dealt with Small Rocket Motors and Gas Generators for Land, Sea, and Air Launched Weapon Systems. The following sub-topics were covered: Ground Launched Systems; Motor Layout and Testing ; Insensitive Munitions; Control Systems; Air Launched Systems; Propellants; Thrust and Impulse Managements; and Motor Service Life. Boosters, ejection motors, lateral thrust devices, and gas generators were covered, and research and operation recommendations were developed. A total of 34 papers from NATO countries are included.
Author
Conferences; Solid Propellant Rocket Engines; Gas Generators; Rocket Launching; Air Launching; Sea Launching; Weapon Systems

20000051539 Rumpf Associates International, Alexandria, VA USA
SOLID PROPULSION AND GAS GENERATORS PAST, PRESENT, AND FUTURE
Derr, Ronald L., Rumpf Associates International, USA; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. K2-1 - K2-10; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

I have worked with both NATO AGARD and DRG for the past twenty years and always believed that these international groups were very effective for gathering information to address the current and future needs of weapon systems used in NATO. It is interesting to note that Dr. Theodore von Karman played a significant role in the development of both of these NATO organizations. In the first part of my talk, I will focus on Dr. Von Karman because of the role he played in two aspects that are important to this meeting: 1) The value of international groups collaborating for the advancement of science and 2) The early days of small solid rocket motors. I will then discuss current important topics related to solid rockets and gas generators. Some of these topics

are identical to those of Dr. von Karman's era. Next, I will talk about future prospects for solid rockets and gas generators and list several challenges we face in the future. Finally. I will make recommendations that address these challenges.
Derived from text
Solid Propellant Rocket Engines; Gas Generators

20000051540 Dynamit Nobel G.m.b.H., Propulsion, Germany
Rocket Motors for Ground-Launched Munitions
Kentgens, H., Dynamit Nobel G.m.b.H., Germany; Schoeffl, R., Dynamit Nobel G.m.b.H., Germany; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 1-1 - 1-7; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

Solid rocket motors are widely used for the propulsion of ground-launched missiles. Munitions, however, are usually launched from mortar-like devices. This launch principle limits the ballistic performance of ground-launched munitions due to recoil and/or acceleration forces. Replacing the closed-breech launcher by a rocket greater range can be achieved at minimal recoil, and, in addition the rocket motor can easily induce spin for stabilization of the munition. A typical application is the use of tractor rockets for smoke grenades or area defence weapons. Built around the munition as annular rocket motors they pull the munition out of a launch tube while spinning it up. Upon reaching the required height at high velocity and spin, both, the speed along the trajectory and/or the spin can be reduced to zero or changed to some other desired value within minimum time by use of a retro-rocket of similar design. Typical burn times are 200 ms or less and spin rates at burn-out of up 50 Hz. Another application of an annular rocket motor is the propulsion of a reconnaissance submunition which is emplaced on ground. The described propulsion unit proved to be safe and reliable during static and dynamic tests. It was demonstrated successfully by a theoretical and experimental approach that a simple, compact, light weight propulsion unit offers a low cost solution for rapid ascent of a payload with high timely and spatial accuracy. The design principles for such rocket motors as well as test results are described.
Author
Rocket Engines; Propulsion; Surface to Air Missiles

20000051543 Nammo Raufoss ASA, Propulsion Div., Raufoss, Norway
Prediction of Flow Losses in a Solid Rocket Motor
Orbekk, Erland, Nammo Raufoss ASA, Norway; Kubberud, Nils, Nammo Raufoss ASA, Norway; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 7-1 - 7-8; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

Nammo Raufoss AS (NA RA) has positive experience in using Computational Fluid Dynamics (CFD) for evaluation of the internal flow path design and prediction of flow losses in solid propellant rocket motors. Our Finite-Volume CFD code has been extended during our participation in the Norwegian Propulsion Technology Development Program by including chemical reactions, boundary conditions for burning of solid propellants and particle flow models. The code is adapted for flow field evaluation of solid grain rocket motors. The numerical method for solving the presented Euler or Navier-Stokes equations is based on an implicit preconditioned time-accurate integration with upwind biased 3rd order accurate finite volume flux formulation. The chemical reactions are defined through curvefits of the Jensen and Jones reaction rate coefficients. The flow domain is represented by structured grids of multi-block type. Turbulence models are of k-epsilon type. The transport equations are solved for each specie including the solid aluminium oxide particles. The code can be used in equilibrium mode, frozen mode or in non equilibrium mode. This paper presents the CFD code at NA RA and its applications on the prediction of flow losses in a solid rocket motor. The gas in the motor chamber is defined with an appropriate set of chemical reactions describing aluminized burning HTPB propellant. The different loss mechanisms in the flow field are calculated, and the results are compared with thrust measurements on fired rocket motors.
Author
Computational Fluid Dynamics; Internal Flow; Structured Grids (Mathematics); K-Epsilon Turbulence Model; Euler Equations of Motion; Navier-Stokes Equation; Finite Volume Method; Solid Propellant Rocket Engines

20000051545 Roketsan A.S., Engineering-Development Group, Ankara, Turkey
Testing and Modelling to Determine the Effect of Spin Rate On the Motor Performance of A Spin Stabilized Rocket
Tinaztepe, H. T., Roketsan A.S., Turkey; Arkun, U., Roketsan A.S., Turkey; Yumusak, M. E., Roketsan A.S., Turkey; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 15-1 - 15-12; In English; See also 20000051537; Copyright Waived; Avail: CASI; A03, Hardcopy

Prediction of the motor performance under spin conditions is especially important in the design of spin stabilised rockets. For this reason, an experimental set up was developed to measure thrust and spin rate parameters of a self-spinning rocket motor.

Data acquired from the tests were used to understand the main relation between spin rate and motor performance. Lumping all the physical effects of spin on the solid propellant burning rate, a model for the spin amplification of the solid propellant burning rate is developed. The model was implied in performance prediction tools to predict spinning rocket motor ballistic performance. This method was applied to the design process of a rocket motor. The spinning motor performance prediction results were compared with the test results and sufficient agreement is attained. In the scope of this study, experimentation and modelling efforts were described with discussions on the application results.
Author
Performance Prediction; Prediction Analysis Techniques; Propulsion System Performance; Systems Health Monitoring; Solid Propellant Rocket Engines

20000051548 Bayern-Chemie G.m.b.H., Aschau, Germany
Design and Verification of a Flight-Weight Nozzleless Integral-Booster for a Ducted Rocket Motor
Weigand, A., Bayern-Chemie G.m.b.H., Germany; Strecker, R., Bayern-Chemie G.m.b.H., Germany; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 22-1 - 22-11; In English; See also 20000051537; Copyright Waived; Avail: CASI; A03, Hardcopy

Nozzleless solid-propellant rocket motors play an important role in the design and operation of ram-propulsion devices. The fact that there are no ejecta during boost to sustain transition makes nozzleless boosters especially suited for the application in future medium range air-to-air missiles with ramjet or ducted-rocket propulsion. The primary function of the nozzleless booster is to accelerate the missile to the required transition Mach number for ducted-rocket operation. Subsequent to burn-out, the empty booster chamber with integrated sustainer nozzle serves as ram-combustion chamber. Therefore, the nozzleless booster can be regarded as being an integral part of the ram-propulsion system. Theoretical performance predictions and results of battleship-hardware testing are presented for a variety of different booster geometries and environmental conditions (e.g., booster length to diameter ratios of 6, 7, and 8, and propellant temperatures of -54 C, +20 C, and +71 C, respectively). Design aspects regarding flight-weight hardware components such as burning chamber, internal insulation, and sustainer-nozzle are discussed. Finally, some information is presented on the demonstration of the booster in flight-weight hardware.
Author
Design Analysis; Engine Design; Nozzleless Rocket Engines; Rocket Nozzles; Ducted Rocket Engines; Booster Rocket Engines

20000051549 Fraunhofer-Inst. fuer Chemische Technologie, Pfinztal, Germany
Features of a Rocket Motor with an End Burning Grain and Smoke Reduced Composite Propellant
Menke, Klaus, Fraunhofer-Inst. fuer Chemische Technologie, Germany; Gerber, Peter, Fraunhofer-Inst. fuer Chemische Technologie, Germany; Geissler, Egon, Fraunhofer-Inst. fuer Chemische Technologie, Germany; Bunte, Gudrun, Fraunhofer-Inst. fuer Chemische Technologie, Germany; Kentgens, Hartmut, Dynamit Nobel Explosivstoff und Systemtechnik G.m.b.H., Germany; Schoeffl, Rainer, Dynamit Nobel Explosivstoff und Systemtechnik G.m.b.H., Germany; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 24-1 - 24-12; In English; See also 20000051537; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy

For underwater propulsion a rocket motor was designed with an end burning grain. The objectives are to operate at the level of 1200 N thrust for 20 sec burning time and to avoid the formation of hot particle exhaust. For this reason a smoke reduced composite propellant based on AP/HTPB with 86% energetic solids including 14% HMX and with 1% ferrocene derivative was adapted to grainsize and motor configuration. For inhibition a pyrolitically stabilized polyurethane insulation was applied. The thermal insulation was made from a stiff high temperature resistant phenolic resin. The propellant exhibited a smooth burning behaviour with good processibility and mechanical properties. The desired performance was delivered at 120 bar operating pressure connected to 165 mm grain diameter and 93% thrust efficiency. Looking closer to the system it was found that part of the ferrocene derivative and plasticizer migrated from the propellant block to the inhibition layer. In the course of migration a small change of burning but a larger change of mechanical properties occurred in the boundary of the propellant. Despite of these disadvantages burning times of 5 and 10 sec had been successfully realized with a case bonded configuration. For larger grain sizes, however, cracks occurred around the surface of the cylindrical propellant block. Calculation of the mechanical stresses which built up upon thermal shrinkage after curing and cooling showed values higher than the mechanical strength of the propellant could fit. These problems finally were overcome by a free standing grain. It led to a successful function of the motor for burning times of 20 sec and more.
Author
Underwater Propulsion; Rocket Engines; Rocket Engine Design; Case Bonded Propellants; Composite Propellants; HMX; HTPB Propellants; Polyurethane Resins; Propellant Grains

20000051551 Office National d'Etudes et de Recherches Aerospatiales, Dept. DEFA, Palaiseau, France

Gas Generator with Fluorine Binder for Reduction of Missile Base Drag ***Generateur de Gaz a Liant Fluore pour Obus a Reduction de Trainee***

Forconi, H., Office National d'Etudes et de Recherches Aerospatiales, France; Masson, C., Office National d'Etudes et de Recherches Aerospatiales, France; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 26-1 - 26-9; In French; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

Injection of hot gas at the base of shells, coming from solid propellant combustion, reduces shell's drag and increases range. This well-known effect is named "Base-Bleed". Usually, the solid propellant contains polybutadiene binder, HTPB or CTPB (20-30%), and ammonium perchlorate (70-80%). The gas generator is incorporated in the shell base. Recently, a new family of gas generators with fuel rich solid propellants has been developed by ONERA for Base-Bleed application. These propellants contain high density fluorinated polyether binder (density is greater than = 1.7), magnesium and ammonium perchlorate. Valuation of propellant grains has been performed on separated full scale tests (155 mm) in gas generator, spin stand and wind tunnel conditions. Satisfactory results have been obtained. The rate of condensed species, contained in the combustion products, is very low (is less than 1%), compared to the HTPB propellants (> 10%), due to the presence of fluorinated compounds and the higher flame temperature (3350 K). Mechanical ability is excellent in spinning up to 15000 rpm. The increase of the burning rate involved by the rotation is limited. Studies of these new propellants in wind tunnel (without spinning), in flight simulation conditions, have shown their ability to rise the shell base pressure and so, to reduce the base drag. These solid gas generators are potentially interesting for Base-Bleed application. This paper describes the recent experimental results obtained for these new energetic materials with fluorinated binder, compared to HTPB fuel rich solid propellants results.

Author

Gas Generators; Gas Injection; High Temperature Gases; Solid Propellant Combustion; Propellant Chemistry; Propellant Binders; Fluorine; Oxidizers

20000051555 Federal Armed Forces Univ., Munich, Germany

Innovative Concept for a Bi-Pulse Rocket Motor

Hoecherl, J., Federal Armed Forces Univ., Germany; Smirra, K., Bayern-Chemie G.m.b.H., Germany; Weinreich, H.-L., Bayern-Chemie G.m.b.H., Germany; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 33-1 - 33-7; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

The following paper presents a novel type of bi-pulse solid propellant rocket motor. After explaining the different missions that benefit from such a propulsion system, the basic methods to separate thrust phases are explained. Multiple pulse rocket motors built in the past and the present are discussed, showing their influence on the new motor that is subject of this paper, whose function and technical parameters are described. Some of the problems arisen during the manufacturing and testing of heavy-weight motors and their solution during the experimental phase are presented, as well as the results of the static firings.

Author

Solid Propellant Rocket Engines; Propulsion System Configurations; Propulsion System Performance; Propulsive Efficiency

20000051556 CELERG, Direction du Business Developpement, Saint-Medard-en-Jalles, France

DESIGN AND MAIN CHARACTERISTICS OF PULSE MOTORS ***Moteurs Pulse: Conception et Caracteristiques***

Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 34-1 - 34-8; In French; See also 20000051537; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy

When possible, modulation of the thrust delivered by a tactical missile rocket motor allows to significantly improve its performance, by adaptation of the flight path and of the conditions of the interception to the actual characteristics of the target. Pulse rocket motors are an example of thrust modulation. The paper describes two different technologies that were fully experimented in the recent years: a solution with a single combustion chamber, in which the second pulse charge is protected by a rubbery thermal barrier from hot gases generated during the first pulse charge operation; and a second one characterized by two combustion chambers, separated by a mechanical barrier (interstage valve). Performance, advantages and drawbacks of the two systems are analyzed.

Author

Missiles; Rocket Engines; Engine Design; Missile Design; Performance Prediction

20000051557 Air Force Research Lab., Edwards AFB, CA USA

MULTI-MISSION HYBRID TACTICAL PROPULSION

Mahaffy, Kevin E., Air Force Research Lab., USA; Hansen, Craig F., Air Force Research Lab., USA; Kirschner, Thomas, Thiokol Propulsion, USA; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 38-1 - 38-12; In English; See also 20000051537; Copyright Waived; Avail: CASI; A03, Hardcopy

The Rocket Propulsion Division of the US Air Force Research Laboratory's Propulsion Directorate at Edwards AFB, California, USA of America is developing hybrid propulsion for air-launched tactical missiles. The forward injected gas generator (FIGG) hybrid motor conveys a liquid oxidizer with monopropellant properties into the head end of a combustion chamber lined with a fuel-rich solid propellant. The advantages of hybrid propulsion include increased specific and total impulse as well as a high degree of energy management capability. This is expected to enable a future tactical capability that uses increased performance missiles that are flexible enough to perform several different missions. Air Force Research Laboratory efforts to date have established the feasibility of the concept through component development and full-scale tactical testing.

Author

Propulsion System Configurations; Hybrid Propulsion; Gas Injection; Fuel Injection; Gas Generators; Rocket Engines

20000051564 Prins Maurits Lab. TNO, Rijswijk, Netherlands

Sidewinder AIM-9L: Assessment of the Effect of 1000 Hours Captive Carriage

Gadiot, G. M. H. J. L., Prins Maurits Lab. TNO, Netherlands; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 47-1 - 47-17; In English; See also 20000051537; Copyright Waived; Avail: CASI; A03, Hardcopy

Within the context of NATO/WEU operations, the Royal Netherlands Air Force stations F-16 planes at Villafranca Air Force Base in Italy. Each plane carries AIM-9L Sidewinder missiles as part of their self-defense weapon suite. Due to their frequent use, a number of these missiles had accumulated around 1000 hours of air carriage. During this period, they have been exposed to direct sunlight, thermal cycling (day-night cycle and ground-air cycle) numerous times and have been subjected to vibrational loads (handling, taxiing, maneuvering). As assessment of the status of a missile that accumulated 1000 flying hours and a missile that had been in deep storage (steady temperature and humidity) should reveal information to allow for a judgement on the level of damage or deterioration of the missile due to its operational use. At the Prins Maurits Laboratory of the Organization of Applied Scientific Research (TNO), a study was carried out for Royal Netherlands Air Force on the damage and deterioration of the AIM-9L due to air carriage.

Author

Sidewinder Missiles; Assessments; Evaluation; Flight Time; Damage; Deterioration

20000052458 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Low Energy Sputtering Experiments for Ion Engine Lifetime Assessment

Duchemin Olivier B., Jet Propulsion Lab., California Inst. of Tech., USA; Polk, James E., Jet Propulsion Lab., California Inst. of Tech., USA; [1999]; 10p; In English

Report No.(s): AIAA Paper 99-2858; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

The sputtering yield of molybdenum under xenon ion bombardment was measured using a Quartz Crystal Microbalance. The measurements were made for ion kinetic energies in the range 100-1keV on molybdenum films deposited by magnetron sputtering in conditions optimized to reproduce or approach bulk-like properties. SEM micrographs for different anode bias voltages during the deposition are compared, and four different methods were implemented to estimate the density of the molybdenum films. A careful discussion of the Quartz Crystal Microbalance is proposed and it is shown that this method can be used to measure mass changes that are distributed unevenly on the crystal electrode surface, if an analytical expression is known for the differential mass-sensitivity of the crystal and the erosion profile. Finally, results are presented that are in good agreement with previously published data, and it is concluded that this method holds the promise of enabling sputtering yield measurements at energies closer to the threshold energy in the very short term.

Author

Ion Engines; Magnetron Sputtering; Quartz Crystals; Life (Durability); Xenon; Ions; Microbalances

20000052472 NASA Marshall Space Flight Center, Huntsville, AL USA

Modeling of Nonacoustic Combustion Instability in Simulations of Hybrid Motor Tests

Rocker, M., NASA Marshall Space Flight Center, USA; February 2000; 62p; In English

Report No.(s): NASA/TP-2000-209905; M-960; NAS 1.60:209905; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A transient model of a hybrid motor was formulated to study the cause and elimination of nonacoustic combustion instability. The transient model was used to simulate four key tests out of a series of seventeen hybrid motor tests conducted by Thiokol, Rocketdyne, and Martin Marietta at NASA Marshall Space Flight Center (MSFC). These tests were performed under the Hybrid Propulsion Technology for Launch Vehicle Boosters (HPTLVB) program. The first test resulted in stable combustion. The second test resulted in large-amplitude, 6.5-Hz chamber pressure oscillations that gradually damped away by the end of the test. The third test resulted in large-amplitude, 7.5-Hz chamber pressure oscillations that were sustained throughout the test. The seventh test resulted in elimination of combustion instability with the installation of an orifice immediately upstream of the injector. Formulation and implementation of the model are the scope of this presentation. The current model is an independent continuation of modeling presented previously by joint Thiokol-Rocketdyne collaborators Boardman, Hawkins, Wassom. and Claflin. The previous model simulated an unstable independent research and development (IR&D) hybrid motor test performed by Thiokol. There was very good agreement between the model and test data. Like the previous model, the current model was developed using Matrix-x simulation software. However, tests performed at MSFC under the HPTLVB program were actually simulated. ln the current model, the hybrid motor, consisting of the liquid oxygen (lox) injector, the multiport solid fuel grain, and nozzle, was simulated. The lox feedsystem, consisting of the tank, venturi. valve, and feed lines, was also simulated in the model. All components of the hybrid motor and lox feedsystem are treated by a lumped-parameter approach. Agreement between the results of the transient model and actual test data was very good. This agreement between simulated and actual test data indicated that the combustion instability in the hybrid motor was due to two causes: 1. a lox feed system of insufficient stiffness, and 2. a lox injector with an impedance (it pressure drop that was too low to provide damping against the feed system oscillations. Also, it was discovered that testing with a new grain of solid fuel sustained the combustion instability. However, testing with a used grain of solid fuel caused the combustion instability to gradually decay.
Author
Computerized Simulation; Mathematical Models; Pressure Oscillations; Injectors; Hybrid Propulsion; Combustion Stability; Frequency Stability

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see categories 24 through 29. For astrochemistry see category 90 Astrophysics.

20000044885 Rutherford Appleton Lab., Chilton, UK
Large Scale Structures
ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 12-15; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Small angle neutron scattering, SANS, and neutron reflectometry are important techniques for the study of a wide range of interesting and relevant phenomena in soft matter, complex fluids, materials science, surfaces and interfaces. The Large Scale Structures Group boasts extensive program of exploitation across this broad area of research, and there is only sufficient space in this chapter to offer a small selection. These instruments effectively exploit the features of pulsed neutron sources; a wide dynamic range and the capability of good resolution. These features, coupled with the selectivity offered by H/D isotopic substitution and neutron polarization, make the study of complex multi-component systems and complex interfaces accessible.
Author
Neutron Scattering; Neutron Sources; Neutrons; Neutron Emission; Optical Measurement; Reflectometers

20000044889 Rutherford Appleton Lab., Chilton, UK
Structural Studies on Organozeolites
The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 28-29; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

There is currently great interest in hybrid microporous organic-inorganic solids, where the organic groups are bound covalently to the inorganic framework and can be chosen to impart organic functionality to the internal surfaces. Although many interesting materials have been prepared, little detailed characterization has been performed, and we have little understanding of the role structure plays in determining the way these materials act as catalysts and sorbents. Neutron diffraction, and in particular its sensitivity to light elements such as hydrogen (as deuterium), carbon, nitrogen and oxygen, provides the ideal tool for structural

studies of such materials. HRPD has been used to provide detailed information on the methyl group configurations, helping us to understand further the properties of these novel materials.
Author
Microporosity; Microstructure; Atomic Structure; Organic Solids; Inorganic Compounds

20000044904 Rutherford Appleton Lab., Chilton, UK
Catalyst Poisoning by Methyl Groups
Albers, P., Deutsche Gold- und Silber-Scheideanstalt-Huels A.G., Germany; Angert, H., Deutsche Gold- und Silber-Scheideanstalt-Huels A.G., Germany; Prescher, G., Deutsche Gold- und Silber-Scheideanstalt-Huels A.G., Germany; Seibold, K., Deutsche Gold- und Silber-Scheideanstalt-Huels A.G., Germany; Parker, S. F., Rutherford Appleton Lab., UK; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 60-61; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Catalysts are an integral feature of everyday life. The most familiar example is as catalytic converters on vehicles to reduce noxious emissions, but they are also an essential part of the refining process that produces petrol from crude oil. Most commodity chemicals can only be produced economically by the use of catalysts. Vibrational spectroscopy has been extensively used to characterize species on catalyst surfaces. Here we tell how inelastic neutron scattering performed on TFXA has helped reveal why an industrial catalyst became deactivated in-process.
Author
Catalytic Activity; Poisoning (Reaction Inhibition); Methyl Compounds

20000046598 Department of the Navy, Washington, DC USA
Mass Loaded Coating and Method for Reducing the Resonant Frequency of a Ceramic Disc
Monahan, Patrick J., Inventor; Oct. 26, 1999; 4p; In English; Supersedes US-Patent-Appl-SN-08127178, AD-D016095.
Patent Info.: Filed 27 Sep. 1993; US-Patent-Appl-SN-08,127,178; US-Patent-5,973,051
Report No.(s): AD-D019650; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A mass-loaded coating includes a predetermined mass of powdered lead which is mixed preferably in a ratio of 3:1 with a liquid polyurethane primer. When painted onto the surface of a disc or plate, the coating mass-loads the disc and lowers the resonant frequency of the disc without significantly increasing the physical dimensions of the disc. Thicker consistency adhesives, such as spreadable paste adhesives or thick putty-like adhesives may be substituted for mass-loading objects having irregular surface textures or complex shapes.
DTIC
Ceramics; Resonant Frequencies; Disks (Shapes); Acoustic Attenuation; Patents

20000046790 NASA Lewis Research Center, Cleveland, OH USA
Aromatic Diamines and Polyimides Based on 4,4'-Bis-(4-Aminophenoxy)-2,2' or 2,2',6,6'- Substituted Biphenyl
Chuang, Chun-Hua K., Inventor, NASA Lewis Research Center, USA; Mar. 14, 2000; 20p; In English; Division of US-Patent-Appl-SN-012173, filed 23 Jan. 1998
Patent Info.: Filed 24 Dec. 1998; NASA-Case-LEW-16384-2; US-Patent-6,037,499; US-Patent-Appl-SN-226633; US-Patent-Appl-SN-012173; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This invention relates the novel diamines. the polyimide oligomers and the polyimides derived therefrom and to the method of preparing the diamines, oligomers and the polyimides. The thermoplastic polyimides derived from the aromatic diamines of this invention are characterized as having a high glass transition temperature. good mechanical properties and improved processability in the manufacture of adhesives. electronic and composite materials for use in the automotive and aerospace industry. The distinction of the novel aromatic diamines of this invention is the 2.2',6.6substituted biphenyl radicals which exhibit noncoplanar conformation that enhances the solubility of the diamine as well as the processability of the polyimides. while retaining a relatively high glass transition temperature and improved mechanical properties at useful temperature ranges.
Official Gazette of the U.S. Patent and Trademark Office
Diamines; Polyimides; Polyphenyls; Solubility; Thermoplasticity

20000048282 General Electric Co., Corporate Research and Development, Schenectady, NY USA
Non-Toxic, Self Cleaning Silicone Foul Release Coatings ***Progress Report, Jan. - Mar. 2000***
Cella, James; Mar. 2000; 7p; In English
Contract(s)/Grant(s): N00014-96-C-0145
Report No.(s): AD-A376014; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The report documents work done from January to March 2000 under the contract N00014-96-C-0145 from Office of Naval Research. The main focus of the report is to design, synthesize and test the foul release coatings.
DTIC
Toxicity; Silicones; Coatings; Metal Coatings

20000052122 NASA Langley Research Center, Hampton, VA USA
Chemistry and Properties of Imide Oligomers from Phenylethynyl-Containing Diamines
Smith, J. G., Jr., NASA Langley Research Center, USA; Connell, J. W., NASA Langley Research Center, USA; High Performance Polymers; 2000; ISSN 0954-0083; Volume 12, pp. 213-223; In English; Copyright; Avail: Issuing Activity

As an extension of work on pendent phenylethynlyl-containing imide oligomer, three new diamines containing pendent phenylethynyl groups were prepared and characterized. These diamines were used to prepare pendent and pendent and terminal phenylethynyl imide oliogomers via the amide acid route in N-methyl-2-pyrrolidinone at a calculated number average molecular weight of 5000 g mol (exp -1). The pendent phenylethynyl groups were randomly distributed along the oliogomer backbone and provided a means of controlling the distance between reactive sites. The imide oligomers were characterized and thermally cured, and the cured polymers evaluated as thin films and compared with materials of similar composition prepared from 3,5-diamino-4'-phenylethynylbenzophenone. This work was performed as part of a continuing research effort to develop structural resins for potential aeronautical applications.
Author
Diamines; Imides; Oligomers; Phenyls; Ethers; Synthesis (Chemistry)

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20000046599 Department of the Navy, Washington, DC USA
Fiber-Reinforced Phthalonitrile Composite Cured with Low-Reactivity Aromatic Amine Curing Agent
Sastri, Satya B., Inventor; Keller, Teddy M., Inventor; Dec. 14, 1999; 10p; In English; Supersedes US-Patent-Appl-SN-08940043
Patent Info.: Filed 2 Oct. 1997; US-Patent-Appl-SN-08,940,043; US-Patent-6,001,926
Report No.(s): AD-D019651; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A fiber-reinforced phthalonitrile composite is made by impregnating or coating a fibrous material with a phthalonitrile prepolymer mixture containing a phthalonitrile monomer and an aromatic amine curing agent that is thermally stable and nonvolatile at a temperature up to about 375 deg C., and that contains at least one electron withdrawing substituent effective to reduce the reactivity of the aromatic amine curing agent with the phithalonitrile monomer.
DTIC
Fiber Composites; Reinforced Plastics; Reinforcing Fibers; Reinforcing Materials

20000046600 Department of the Navy, Washington, DC USA
Non-Thermal Process for Annealing Crystalline Materials
Manka, Charles K., Inventor; Grun, Jacob, Inventor; Covington, Billy C., Inventor; Donnelly, David W., Inventor; Dec. 14, 1999; 8p; In English; Supersedes US-Patent-Appl-SN-08670909
Patent Info.: Filed 26 Jun. 1996; US-Patent-Appl-SN-08,670,909; US-Patent-6,001,715
Report No.(s): AD-D019652; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Bulk crystalline materials are annealed by introducing into them mechanical energy of sufficient intensity to create a large amplitude sound wave. The mechanical energy may be introduced into the material, for example, by laser ablation. Where the bulk crystalline material is a doped semiconductor, the process also electrically activates the material.
DTIC
Annealing; Crystals; Crystallinity; Crystal Structure; Doped Crystals; Semiconductors (Materials); Semiconductor Devices

20000048259 NASA Langley Research Center, Hampton, VA USA

Fire Resistant, Moisture Barrier Membrane

St.Clair, Terry L., Inventor, NASA Langley Research Center, USA; Jan. 25, 2000; 6p; In English; Division of US-Patent-Appl-SN-772052, filed 9 Dec. 1996 and provision of US-Patent Appl-SN-008765, filed 15 Dec. 1995

Patent Info.: Filed 12 Feb. 1998; NASA-Case-LAR-15437-2; US-Patent-6,017,637; US-Patent-Appl-SN-022745; US-Patent-Appl-SN-772052; US-Patent-Appl-SN-008765; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A waterproof and breathable, fire-resistant laminate is provided for use in tents, garments, shoes, and covers, especially in industrial, military and emergency situations. The laminate permits water vapor evaporation while simultaneously preventing liquid water penetration. Further, the laminate is fire-resistant and significantly reduces the danger of toxic compound production when exposed to flame or other high heat source. The laminate may be applied to a variety of substrates and is comprised of a silicone rubber and plurality of fire-resistant, inherently thermally-stable polyimide particles.

Official Gazette of the U.S. Patent and Trademark Office

Laminates; Waterproofing; Thermal Stability; Silicone Rubber; Polyimides; Heat Sources; Flame Retardants

20000048260 NASA Langley Research Center, Hampton, VA USA

Pistons and Cylinders Made of Carbon-Carbon Composite Materials

Rivers, H. Kevin, Inventor, NASA Langley Research Center, USA; Ransone, Philip O., Inventor, NASA Langley Research Center, USA; Northam, G. Burton, Inventor, NASA Langley Research Center, USA; Schwind, Francis A., Inventor, NASA Langley Research Center, USA; Apr. 04, 2000; 10p; In English; Provision of US-Patent-Appl-SN-012933, filed 6 Mar. 1996

Patent Info.: Filed 28 Feb. 1997; NASA-Case-LAR-15493-1; US-Patent-6,044,819; US-Patent-Appl-SN-808290; US-Patent-Appl-SN-012933; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An improved reciprocating internal combustion engine has a plurality of engine pistons, which are fabricated from carbon-carbon composite materials, in operative association with an engine cylinder block, or an engine cylinder tube, or an engine cylinder jug, all of which are also fabricated from carbon-carbon composite materials.

Official Gazette of the U.S. Patent and Trademark Office

Carbon-Carbon Composites; Technology Assessment; Pistons; Fabrication

20000048621 Florida Univ., Dept. of Chemistry and Physics, Gainesville, FL USA

Partial Financial Support of the 1999 American Chemical Society Chemistry of Materials Award Symposium *Final Report, 20 Mar.-30 Sep. 1999*

Reynolds, J. R.; Sep. 30, 1999; 4p; In English

Contract(s)/Grant(s): N00014-99-1-0518

Report No.(s): AD-A375956; TR-2; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Funding of $5,000 from the Office of Naval Research was received which partially supported the travel expenses of a set of invited speakers for the 1999 ACS Award in the Chemistry of Materials. These funds were divided amongst the participants from the USA. This symposium was jointly organized by John Reynolds (University of Florida) and Marie Angelopolous (IBM). The Polymeric Materials Science and Engineering (PMSE) Division held a special symposium in honor of the Chemistry of Materials Award winner, Alan G. MacDiarmid, Blanchard Professor of Chemistry at the University of Pennsylvania, at the Spring 1999 ACS National Meeting in Anaheim, California.

DTIC

Conferences; USA; Chemistry; Composite Materials; Finance

20000050218 NASA Langley Research Center, Hampton, VA USA

Method for Fabricating Composite Structures Using Pultrusion Processing

Farley, Gary L., Inventor, NASA Langley Research Center, USA; Mar. 07, 2000; 8p; In English; Division of US-Patent-Appl-SN-511568, filed 4 Aug. 1995. See also US-Patent-6,033,510

Patent Info.: Filed 23 Sep. 1997; NASA-Case-LAR-15128-4; US-Patent-6,033,511; US-Patent-Appl-SN-936783; US-Patent-Appl-SN-511568; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A method for fabricating composite structures at a low-cost, moderate-to-high production rate. A first embodiment of the method includes employing a continuous press forming fabrication process. A second embodiment of the method includes employing a pultrusion process for obtaining composite structures. The methods include coating yarns with matrix material, weaving the yarn into fabric to produce a continuous fabric supply and feeding multiple layers of net-shaped fabrics having optimally oriented fibers into a debulking tool to form an undebulked preform. The continuous press forming fabrication process includes partially debulking the preform, cutting the partially debulked preform and debulking the partially debulked preform to

form a net-shape. An electron-beam or similar technique then cures the structure. The pultrusion fabric process includes feeding the undebulked preform into a heated die and gradually debulking the undebulked preform. The undebulked preform in the heated die changes dimension until a desired cross-sectional dimension is achieved. This process further includes obtaining a net-shaped infiltrated uncured preform, cutting the uncured preform to a desired length and electron-beam curing (or similar technique) the uncured preform. These fabrication methods produce superior structures formed at higher production rates, resulting in lower cost and high structural performance.
Official Gazette of the U.S. Patent and Trademark Office
Technologies; Fabrication; Composite Structures; Pultrusion; Matrix Materials

20000050219 NASA Langley Research Center, Hampton, VA USA
Method for Fabricating Composite Structures Using Pultrusion Processing
Farley, Gary L., Inventor, NASA Langley Research Center, USA; Mar. 07, 2000; 8p; In English; Division of US-Patent-Appl-SN-511568, filed 4 Aug. 1995. See also US-Patent-6,033,511
Patent Info.: Filed 23 Sep. 1997; NASA-Case-6,033510; US-Patent-6,033,510; US-Patent-Appl-SN-933735; US-Patent-Appl-SN-511568; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A method for fabricating composite structures at a low-cost, moderate-to-high production rate. A first embodiment of the method includes employing a continuous press forming fabrication process. A second embodiment of the method includes employing a pultrusion process for obtaining composite structures. The methods include coating yarns with matrix material, weaving the yarn into fabric to produce a continuous fabric supply and feeding multiple layers of net-shaped fabrics having optimally oriented fibers into a debulking tool to form an undebulked preform. The continuous press forming fabrication process includes partially debulking the preform, cutting the partially debulked preform and debulking the partially debulked preform to form a netshape. An electron-beam or similar technique then cures the structure. The pultrusion fabric process includes feeding the undebulked preform into a heated die and gradually debulking the undebulked preform. The undebulked preform in the heated die changes dimension until a desired cross-sectional dimension is achieved. This process further includes obtaining a net-shaped infiltrated uncured preform, cutting the uncured preform to a desired length and electronbeam curing (or similar technique) the uncured preform. These fabrication methods produce superior structures formed at higher production rates, resulting in lower cost and high structural performance.
Official Gazette of the U.S. Patent and Trademark Office
Technologies; Fabrication; Composite Structures; Pultrusion; Preforms; Presses

20000052123 NASA Langley Research Center, Hampton, VA USA
Phenylethynyl Containing Imide Oligomers
Hergenrother, P. M., NASA Langley Research Center, USA; Connell, J. W., NASA Langley Research Center, USA; Smith, J. G., Jr., NASA Langley Research Center, USA; Polymer; 2000; ISSN 0032-3861; Volume 41, pp. 5073-5081; In English; Copyright; Avail: Issuing Activity

As part of a program to develop high performance/high temperature adhesives and composite matrices for a Mach 2.4 high speed civil transport, imide oligomers containing phenylethynyl groups were investigated. Phenylethynyl groups were placed on the ends of oligomers of different molecular weights (1250, 2500 and 5000 g/mol), pendent along the backbone of oligomers and both pendent and terminal on oligomers. Many different compositions of phenylethynyl containing imide oligomers had been previously prepared and evaluated before selecting the composition based upon 3,3'.4,4'-biphenyltetracarboxcylic dianhydride (BPDA), 3.4'-oxydianiline (3,4'-ODA) and 1,3-bis(3-aminophenoxy)benzene (APB) for extensive work. 4-Phenylethynylphthalic anhydride (PEPA) was used to place phenylethynyl groups on the ends of the oligomers and 3,5-diamino-4'-phenylethynylbenzophenone (DPEB) was used to introduce pendent phenylethynyl groups along the oligomeric backbone. Upon heating above 300 C, the phenylethynyl groups react to provide chain extension, branching and cross linking. Several of these materials exhibited excellent properties as adhesives and composite matrices. The chemistry, processability and properties of the oligomers, the cured polymers, bonded specimens and composites from phenylethynyl containing oligomers are presented.
Author
Imides; Oligomers; Phenyls; Civil Aviation; Supersonic Speed; Adhesives; Matrix Materials

20000052503 NASA Langley Research Center, Hampton, VA USA

Effects of Imperfections on the Buckling Response of Compression-Loaded Composite Shells

Hilburger, Mark W., NASA Langley Research Center, USA; Starnes, James H., Jr., NASA Langley Research Center, USA; [2000]; 15p; In English; 41st; 41st Structural, Structural Dynamics and Materials Conference, 3-6 Apr. 2000, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-1387; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results of an experimental and numerical study of the effects of imperfections on the buckling response of unstiffened thin-walled composite cylindrical shells are presented. Results that identify the individual and combined effects of traditional initial geometric shell-wall imperfections and non-traditional shell-wall thickness variations, shell-end geometric imperfections and variations in loads applied to the ends of the shells on the shell buckling response are included. In addition, results illustrating the effects of manufacturing flaws in the form of gaps between adjacent pieces of graphite-epoxy tape in some of the laminate plies are presented in detail. The shells have been analyzed with a nonlinear finite-element analysis code that accurately accounts for these effects on the buckling and nonlinear responses of the shells. The numerical results indicate that traditional and nontraditional initial imperfections can cause a significant reduction in the buckling load of a compression-loaded composite shell. Furthermore, the results indicate that the imperfections couple in a nonlinear manner. The numerical results correlate well with the experimental results. The nonlinear analysis results are also compared to the results from a traditional linear bifurcation buckling analysis. The results suggest that the nonlinear analysis procedure can be used for determining accurate, high-fidelity design knockdown factors for shell buckling and collapse. The results can also be used to determine the effects of manufacturing tolerances on the buckling response of composite shells.

Author

Composite Structures; Experimentation; Data Acquisition; Numerical Analysis; Compressibility Effects; Thin Walls; Shells (Structural Forms); Graphite-Epoxy Composites

20000052512 Ohio State Univ., Research Foundation, Columbus, OH USA

Deformation and Fracture of Laminated Intermetallic Materials ***Final Report, 1 Jul. 1996-31 Jul. 1999***

Anderson, Peter M.; Fraser, Hamish L.; Feb. 29, 2000; 38p; In English

Contract(s)/Grant(s): F49620-96-1-0238

Report No.(s): AD-A375227; AFRL-SR-BL-TR-00-0077; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project began with both an experimental effort to produce gamma-Ni(Al)/gamma'-Ni3Al multilayers and a modeling effort to understand the strength of such multilayers. The experimental work progressed to the point that, for the first time known to the investigators, gamma-Ni(Al)/gamma'-Ni3Al multilayers have been produced by magnetron sputtering. Samples with individual layer thicknesses ranging from 20nm/20nm to 120nm/120nm have been produced and two epitaxies, is less than 001> and is less than 111>, been achieved. With respect to modeling, results (see Fig. 28) show how the choice of layer thickness, volume fraction, and interfacial strength affect the strength of such materials. Peierls model of resistance of interfaces to slip transmission also was developed in an effort understand the principal role of atomic bonding properties and modulus mismatch across interface the strength of interfaces to transmission.

DTIC

Plastic Deformation; Fracturing; Fracture Mechanics; Laminates; Intermetallics

25
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also 34 Fluid Dynamics and Thermodynamics, For astrochemistry see category 90 Astrophysics.

20000044887 Rutherford Appleton Lab., Chilton, UK

High Resolution Spectroscopy

ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 18-19; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

The molecular sciences group operates four spectrometers covering the energy range from the very highest to the very lowest energy transfers available on ISIS; eVS, electron-volt energies; TOSCA, millielectron-volt energies, and; OSIRIS and IRIS, microelectron-volt energies.

Author

High Resolution; Electron Spectroscopy; Emission Spectra

20000044894 Rutherford Appleton Lab., Chilton, UK

Cluster Formation in Supercritical Methanol

Yamaguchi, T., Fukuoka Univ., Japan; Benmore, C., Rutherford Appleton Lab., UK; Soper, A., Rutherford Appleton Lab., UK; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 38-39; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Hydrogen-bonded liquids such as water and methanol in the supercritical state have unique properties not available under ambient conditions. They have attracted much attention in supercritical fluid technology as a novel reaction medium for the decomposition of organic wastes like dioxine and polychlorobiphenyl (PCB), and in the recovery of useful chemicals from industrial plastic wastes like polyethyleneterephthalate (PET). Since the critical parameters of methanol are lower than those for water, methanol is a good co-solvent (entrainer) in various reactions in supercritical water at moderate reaction conditions. It also works as a novel medium for chemical reactions in its own right. Whilst the degree of hydrogen bonding in supercritical water has been extensively explored, studies of other supercritical hydrogen bonded fluids are much less complete. Neutron diffraction on supercritical methanol using SANDALS is providing a detailed understanding of hydrogen bonding in this system.

Author

Atomic Clusters; Molecular Clusters; Hydrogen Bonds; Methyl Alcohol; Supercritical Fluids

20000044898 Rutherford Appleton Lab., Chilton, UK

Negative Thermal Expansion in Ice Ih

Bennington, S. M., Rutherford Appleton Lab., UK; Li, J., Manchester Coll. of Science and Technology, UK; Harris, M., Rutherford Appleton Lab., UK; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 48-49; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Many tetrahedrally bonded materials show negative thermal expansion at low temperatures; for example, the thermal expansion of ice becomes negative below 80K. The dynamics of ice, even in its natural hexagonal form, are still a puzzle despite many decades of work. The combination of the rotational disorder and the complexity of the inter-molecular forces make modelling the system difficult. by measuring the temperature dependence of the acoustic phonons in ice using PRISMA, not only were we able to determine which modes are responsible for the negative thermal expansion, but also the point within the Brillouin zone where the effect occurs.

Author

Thermal Expansion; Gruneisen Constant; Ice; Low Temperature

20000044901 Rutherford Appleton Lab., Chilton, UK

Understanding the Anomalous Thermal Properties of Para-Hydrogen

Bermejo, F. J., Consejo Superior de Investigaciones Cientificas, Spain; Dawidowski, J., Consejo Superior de Investigaciones Cientificas, Spain; Cabrillo, C., Consejo Superior de Investigaciones Cientificas, Spain; Bennington, S. M., Rutherford Appleton Lab., UK; Fak, B., Nuclear Research Center of Grenoble, France; Verkerk, P., Technische Univ., Netherlands; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 54-55; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

The properties of hydrogen are important in a wide range of scientific and technical areas, from its role as one of the major constituents of the gas-giants, where it exists in various phases over an enormous range of pressures and temperatures, to its practical uses as a cryogenic liquid and an environmentally clean fuel. However, the macroscopic heat transport properties of liquid hydrogen are still poorly understood despite it being composed of the simplest stable molecules. We have set out to explore the spectrum of microscopic collective excitations of liquid p-H2 using the MARI spectrometer. Our results show that surprisingly well defined, phonon-like excitations exist within the liquid which we believe contribute to the anomalously large value of thermal conductivity in p-H2.

Author

Thermodynamic Properties; Para Hydrogen; Hydrogen; Pressure Distribution; Temperature Distribution; Transport Properties; Liquid Hydrogen; Clean Fuels

20000044903 Rutherford Appleton Lab., Chilton, UK

Momentum Distribution Spectroscopy by Neutron Compton Scattering

Reiter, G., Houston Univ., USA; Mayers, J., Rutherford Appleton Lab., UK; Noreland, J., Uppsala Univ., Sweden; Delaplane, R., Uppsala Univ., Sweden; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 58-59; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

The measurement of proton momentum distributions by neutron scattering is analogous to the measurement of electron momentum distributions by Compton scattering and is known as Neutron Compton scattering (NCS). NCS measurements on protons have only become possible since the construction of intense accelerator sources such as ISIS, which allow inelastic neutron scattering measurements with energy transfers in the electron volt (eV) region. The eVS spectrometer at ISIS has been performing measurements of proton momentum distributions in isotropic samples for a number of years and the technique has now been extended to exploit the much more detailed behavior on proton dynamics which can be obtained from single crystal data.
Author
Momentum; Protons; Electron Distribution; Electron Scattering; Inelastic Scattering; Neutron Scattering; Compton Effect

20000045689 NASA Kennedy Space Center, Cocoa Beach, FL USA
Process and Equipment for Nitrogen Oxide Waste Conversion to Fertilizer
Lueck, Dale E., Inventor, NASA Kennedy Space Center, USA; Parrish, Clyde F., Inventor, NASA Kennedy Space Center, USA; Mar. 21, 2000; 34p; In English
Patent Info.: Filed 3 Dec. 1996; NASA-Case-KSC-11884-1; US-Patent-6,039,783; US-Patent-Appl-SN-772057; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The present invention describes a process for converting vapor streams from sources containing at least one nitrogen-containing oxidizing agent therein to a liquid fertilizer composition comprising the steps of: (1) directing a vapor stream containing at least nitrogen-containing oxidizing agent to a first contact zone; (2) contacting said vapor stream with water to form nitrogen oxide(s) from said at least one nitrogen- containing oxidizing agent; (3) directing said acid(s) as a second stream to a second contact zone; (4) exposing said second stream to hydrogen peroxide which is present within said second contact zone in a relative amount of at least 0.1% by weight of said second stream within said second contact zone to convert at least some of any nitrogen oxide species or ions other than in the nitrite form present within said second stream to nitrate ion; (5) sampling said stream within said second contact zone to determine the relative amount of hydrogen peroxide within said second contact zone; (6) adding hydrogen peroxide to said second contact zone when a level on hydrogen peroxide less than 0.1% by weight in said second stream is determined by said sampling; (7) adding a solution comprising potassium hydroxide to said second stream to maintain a pH between 6.0 and 11.0 within said second stream within said second contact zone to form a solution of potassium nitrate; and (8) removing sais solution of potassium nitrate from said second contact zone.
Author
Nitrogen Oxides; Waste Treatment; Fertilization; Nitrates; Oxidation; Potassium Hydroxides

20000046616 Brigham Young Univ., Dept. of Chemistry and Biochemistry, Provo, UT USA
Bis-(quinolin-8-ylmethyl)-substituted Diaza-18-crown-6: Synthesis and Metal Ion Complexation Properties
Bradshaw, Jerald S., Brigham Young Univ., USA; Xue, Guoping, Brigham Young Univ., USA; Zhang, Xian X., Brigham Young Univ., USA; Savage, Paul B., Brigham Young Univ., USA; Krakowiak, Krzysztof E., Brigham Young Univ., USA; Mar. 16, 2000; 9p; In English
Contract(s)/Grant(s): N00014-98-1-0485
Report No.(s): AD-A375274; TR-16; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

N,N-Bis-(quinolin-8-ylmethyl)diaza-l 8-crown-6 (L) was prepared in a high yield by treating diaza-18-crown-6 with 8-bromomethylquinoline in the presence of triethylamine. Ligand L interacted strongly with Na(+), K(+), Mg(2+), Co(2+), Cu(2+), Ni(2+), and Zn(2+) as shown by calorimetric titration and UV-Visible spectrophotometric techniques. The ligand exhibited a good selectivity for Cu(2+) over Ni(2+). The calorimetric titration indicated that ligand L forms both mononuclear and binuclear complexes with Cu(2+).
DTIC
Metal Ions; Copper; Nickel

20000048811 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Tar Production from Biomass Pyrolysis in a Fluidized Bed Reactor: A Novel Turbulent Multiphase Flow Formulation
Bellan, J., Jet Propulsion Lab., California Inst. of Tech., USA; Lathouwers, D., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 7p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A novel multiphase flow model is presented for describing the pyrolysis of biomass in a 'bubbling' fluidized bed reactor. The mixture of biomass and sand in a gaseous flow is conceptualized as a particulate phase composed of two classes interacting with the carrier gaseous flow. The solid biomass is composed of three initial species: cellulose, hemicellulose and lignin. From each of these initial species, two new solid species originate during pyrolysis: an 'active' species and a char, thus totaling seven solid-biomass species. The gas phase is composed of the original carrier gas (steam), tar and gas; the last two species originate from

the volumetric pyrolysis reaction. The conservation equations are derived from the Boltzmann equations through ensemble averaging. Stresses in the gaseous phase are the sum of the Newtonian and Reynolds (turbulent) contributions. The particulate phase stresses are the sum of collisional and Reynolds contributions. Heat transfer between phases, and heat transfer between classes in the particulate phase is modeled, the last resulting from collisions between sand and biomass. Closure of the equations must be performed by modeling the Reynolds stresses for both phases. The results of a simplified version (first step) of the model are presented.
Author
Biomass; Multiphase Flow; Pyrolysis; Tars; Turbulent Flow; Mathematical Models; Beds (Process Engineering); Chemical Reactors

20000050359 Rutherford Appleton Lab., ISIS Facility, Chilton, UK
Selection, Rejection and Optimization of Pyrolytic Graphite (PG) Crystal Analyzers for Use on the New IRIS Graphite Analyzer Bank
Marshall, P. J., Rutherford Appleton Lab., UK; Sivia, D. S., Rutherford Appleton Lab., UK; Adams, M. A., Rutherford Appleton Lab., UK; Telling, M. T. F., Rutherford Appleton Lab., UK; Jan. 27, 2000; ISSN 1358-6254; 38p; In English
Report No.(s): PB2000-103220; RAL-TR-2000-003; Copyright; Avail: National Technical Information Service (NTIS)
This report discusses design problems incurred by equipping the IRIS high-resolution inelastic spectrometer at the ISIS pulsed neutron source, UK with a new 4212 piece pyrolytic graphite crystal analyzer array. of the 4212 graphite pieces required, approximately 2500 wil be newly purchased PG crystals with the remainder comprising of the currently installed graphite analyzers. The quality of the new analyzer pieces, with respect to manufacturing specifications, is assessed, as is the optimum arrangement of new PG pieces amongst old to circumvent degradation of the spectrometer's current angular resolution. Techniques employed to achieve these criteria include accurate calliper measurements, FORTRAN programming and statistical analysis.
NTIS
Neutron Spectrometers; Design Analysis; Statistical Analysis; Spectrometers; Manufacturing; Computer Programming; Angular Resolution

20000050370 National Inst. of Standards and Technology, Gaithersburg, MD USA
Fire Dynamics Simulator: User's Manual
McGrattan, K. B.; Forney, G. P.; Jan. 2000; 60p; In English
Report No.(s): PB2000-104812; NISTIR-6469; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Fire Dynamics Simulator (FDS) is a computational fluid dynamics (CFD) model of fire-driven fluid flow. The software described in this document solves numerically a form of the Navier-Stokes equations appropriate for low-speed, thermally-driven flow with an emphasis on smoke and heat transport from fires. The intent of this User's Manual is to explain how calculations are performed and how to analyze the results.
NTIS
Computational Fluid Dynamics; Fluid Flow; User Manuals (Computer Programs); Heat Transfer; Fires

20000050371 National Inst. of Standards and Technology, Gaithersburg, MD USA
Fire Dynamics Simulator: Technical Reference Guide
McGrattan, K. B.; Baum, H. R.; Rehm, R. G.; Hamins, A.; Forney, G. P.; Jan. 2000; 44p; In English
Report No.(s): PB2000-104811; NISTIR-6467; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Contents include the following: Introduction; Hydrodynamic Model; Combustion; Thermal Boundary Conditions; Sprinklers; Numerical Method; Conclusion; Nomenclature; References.
NTIS
Fires; Combustion

20000051523 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
A Model for the Infrared Radiance of Optically Thin, Particulate Exhaust Plumes Generated by Pyrotechnic Flares Burning in a Vacuum
Cohen, Douglas L.; Mar. 29, 2000; 51p; In English
Contract(s)/Grant(s): F19628-85-C-0002
Report No.(s): AD-A375670; TR-821; ESD-TR-88-223; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report sets up a model for the intensity of infrared radiation emitted by a particulate exhaust plume generated by a pyrotechnic flare burning in a vacuum. The model assumes that the exhaust plume is optically thin, that it is composed mostly of dis-

crete particles, that the particles have a size spectrum described by a log-normal probability density function, that they cool off entirely by the emission of thermal radiation, and that they all travel at the same average velocity. The model is used to predict how a magnesium-Teflon exhaust plume would look when viewed as an approximate point source by a distant infrared sensor and also to analyze the data acquired from three separate magnesium-Teflon flares burned in a large vacuum chamber.
DTIC
Infrared Radiation; Radiance; Exhaust Gases; Plumes; Particulates

20000052250 Space and Naval Warfare Systems Center, San Diego, CA USA
Tetra-Methyl Ammonium Hydroxide (TMAH) Preferential Etching for Infrared Pixel Arrays
Sullivan, P.; Offord, B. W.; Aklufi, M. E.; Jan. 2000; 22p; In English
Report No.(s): AD-A375429; TD-3097; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An infrared scene simulator employs a silicon-based micromachined Complementary Metal Oxide Semiconductor (CMOS) electronic-driven array of miniature infrared heater elements. The IR pixel array is based upon the suspension of micro-heaters over a micromachined cavity in the silicon substrate. A polysilicon resistor is used as the infrared emitter. to create IR scene generators with sufficient resolution, a large number of micro-heaters need to be produced in an array. A CMOS/microelectromechanical systems (MEMS) approach to creating these scene generators was chosen as cost effective. The CMOS electronics are produced at a commercial or otherwise standard foundry, and the resultant wafers are put through a post-processing etch step to create monolithic thermal pixel arrays (TPAs). A post-processing etch needs to completely isolate the heaters, and not affect the CMOS electronics in any way. The silicon etchant that was used as a method of thermal isolation was a tetra-methyl ammonium hydroxide (TMAH) solution.
DTIC
CMOS; Microelectromechanical Systems; Micromachining; Etching; Infrared Detectors; Infrared Radiation; Emitters

20000052447 Army Research Lab., Sensors Directorate, Adelphi, MD USA
Simulation of Mass Transfer Process for Polymer Electrolyte Membrane Fuel Cell Stack ***Progress Report, Oct. 1998-Sep. 1999***
Chu, Deryn; Jiang, Rongzhong; Feb. 2000; 15p; In English
Report No.(s): AD-A375286; ARL-TR-2086; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We propose an empirical equation to simulate the potential-current and power-current curves for a polymer electrolyte membrane fuel cell (PEMFC) stack. The equation has been demonstrated to fit experimental curves excellently for the entire reaction process, including activation, ohmic, and mass-transfer controls. Using this equation to simulate the mass-transfer process will not cause different results for the E(sub 0), b, and R values than using the analytical equation (E(sub i) = E(sub 0) - b log i - Ri). The effect of each mass-transfer parameter on the shape of the potential-current and power-current curves are compared, and overall they show a regular variation. We also analyzed the effect of relative humidity on the performance of a strip design PEMFC stack.
DTIC
Simulation; Mass Transfer; Electrolytic Cells; Fuel Cells

26
METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20000046603 Department of the Navy, Washington, DC USA
Method for Making Silicon Germanium Alloy and Electric Device Structures
Dubbelday, Wadad B., Inventor; de la Houssaye, Paul R., Inventor; Kasa, Shannon D., Inventor; Lagnado, Isaac, Inventor; Sep. 14, 1999; 7p; In English; Supersedes US-Patent-Appl-SN-08851768
Patent Info.: Filed 6 May 1997; US-Patent-Appl-SN-08,851,768; US-Patent-5,951,757
Report No.(s): AD-D019656; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method for fabricating silicon-germanium alloy on a sapphire substrate of the present invention comprises the steps of passivating a surface of a sapphire substrate, maintaining a deposition temperature of about 900 degrees C., exposing the passivated surface to a flow of about 1 slm of about 2 percent silane in a hydrogen carrier and a flow of at least 200 sccm of about 10 percent germane in a hydrogen carrier to form a layer of single crystal silicon germanium alloy on the passivated surface of the sapphire

substrate, and ramping the temperature down to about 650 degrees C. during the step of exposing the passivated surface to the germane gas.
DTIC
Fabrication; Silicon Alloys; Germanium Alloys; Electronic Equipment

20000046787 NASA Lewis Research Center, Cleveland, OH USA
Process for Producing Metal Compounds from Graphite Oxide
Hung, Ching-Cheh, Inventor, NASA Lewis Research Center, USA; Mar. 21, 2000; 6p; In English; Division of US-Patent-Appl-SN-833107, filed 4 Apr. 1997
Patent Info.: Filed 14 Oct. 1998; NASA-Case-LEW-16342-2; US-Patents-6,039,930; US-Patent-Appl-SN-172520; US-Patent-Appl-SN-833107; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A process for providing elemental metals or metal oxides distributed on a carbon substrate or self-supported utilizing graphite oxide as a precursor. The graphite oxide is exposed to one or more metal chlorides to form an intermediary product comprising carbon. metal. chloride. and oxygen This intermediary product can be flier processed by direct exposure to carbonate solutions to form a second intermediary product comprising carbon. metal carbonate. and oxygen. Either intermediary product may be further processed: a) in air to produce metal oxide: b) in an inert environment to produce metal oxide on carbon substrate: c) in a reducing environment. to produce elemental metal distributed on carbon substrate. The product generally takes the shape of the carbon precursor.
Official Gazette of the U.S. Patent and Trademark Office
Procedures; Carbon; Substrates; Metal Oxides; Graphite

20000047267 Elektroniksystem- und Logistik G.m.b.H., Munich, Germany
Cadmium, A Health Hazard Surface Treatment
Rehm, C., Elektroniksystem- und Logistik G.m.b.H., Germany; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 4-1 - 4-20; In English; See also 20000047263; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The use of materials involving health risks represents a health risk in general and an environmental risk. In some instances restrictions have been imposed on the marketing of materials that are injurious to health and on the use of specific hazardous materials and their processing. This is the case with asbestos, PCB/PCT, cadmium and cadmium alloys, etc. These restrictions are published within the European Union in what are known as EEC Directives (EEC 76/769). If individual countries within the European Union wish to adopt these restrictions, these restrictions have to be implemented by passing legislation at a national level. Implementation of this EEC Directive under German law resulted in the Chemicals Prohibitory Regulation (Chemikalien-Verbotsverordnung). Thus, for example, cadmium and its alloys must not be marketed pursuant to this EEC Directive and the Chemicals Prohibitory Regulation. However, the present legal situation does allow a few exceptions. One exception, for example, is aerospace, where cadmium may still be brought into circulation and used. This affects the military sector to an equal extent. Cadmium is still used today for surface treatment (corrosion protection) in a large number of weapon systems. Hazards to humans and the environment arise from cadmium in the following specific processes: (1) manufacturing (electroplating processes); (2) maintenance and repair jobs; and (3) disposal, of course.
Derived from text
Cadmium; Hazardous Materials; Materials Handling

20000047293 Kawasaki Heavy Industries Ltd., Gifu, Japan
Studies on Long Term Durability of Aluminum Airframe Structure made by Affordable Process
Hira, Hirohito, Kawasaki Heavy Industries Ltd., Japan; Yoshino, Yasuaki, Kawasaki Heavy Industries Ltd., Japan; New Metallic Materials for the Structure of Aging Aircraft; April 2000, pp. 11-1 - 11-7; In English; See also 20000047290; Copyright Waived; Avail: CASI; A02, Hardcopy

Affordability is one of the most important problems of today's development of airframe especially for aluminum alloy application. Some new aluminum alloys and improved processes are being applied to production cost reduction, and tests related to long term durability of applied structures are also carried out. In this report, our recent studies of following three affordable process methods to aluminum alloy structures are introduced, these are outline of process studies and their merits, and mechanical properties, fatigue properties and corrosion resistance. (1) Application of new 6000 series alloy of high formability; (2) Application of premium precision casting; and (3) Application of superplastic forming.
Author
Research; Durability; Airframes; Aluminum Alloys; Service Life; Mechanical Properties

20000047294 Rome Univ., School of Aerospace Engineering, Rome, Italy

Plastic Envelope in Propagating Crack Wake on Al-Li Alloys Subjected to Fatigue Cycles and to Different Heat Treatments

Corradi, S., Rome Univ., Italy; Marchetti, M., Rome Univ., Italy; Stellino, W., Rome Univ., Italy; New Metallic Materials for the Structure of Aging Aircraft; April 2000, pp. 12-1 - 12-13; In English; See also 20000047290; Copyright Waived; Avail: CASI; A03, Hardcopy

The aim of this research is to study the fracture behaviour of three Al-Li alloys (2091-21958090), using standard CT specimens, in the frequency range of 1-10 Hz. Each of these three alloys is subjected to different heat treatments and its homogeneity is analysed, before and after treatments, by Scanning Electron Microscope (SEM). Crack tip opening displacements and plastic zone envelope analyses are fully treated by experimental and numerical results and fatigue crack growth process is extensively reported. At the end of fatigue tests, specimen fracture surfaces have been deeply analysed by SEM in order to individualize the characteristics of fracture as function of frequency, AK and load ratio R.

Author

Crack Propagation; Wakes; Aluminum Alloys; Lithium Alloys; Fatigue Tests; Fracture Mechanics; Heat Treatment; Metal Fatigue

20000047296 Institute for Aerospace Research, Structures, Materials and Propulsion Lab., Ottawa, Ontario Canada

RRA Heat Treatment of Large Al 7075-T6 Components

Holt, R. T., Institute for Aerospace Research, Canada; Raizenne, M. D., Institute for Aerospace Research, Canada; Wallace, W., Institute for Aerospace Research, Canada; DuQuesnay, D. L., Royal Military Coll. of Canada, Canada; New Metallic Materials for the Structure of Aging Aircraft; April 2000, pp. 7-1 - 7-11; In English; See also 20000047290; Copyright Waived; Avail: CASI; A03, Hardcopy

Retrogression and re-aging (RRA) is a heat treatment process performed on the aluminum alloy 7075 in the T6xxx temper condition to improve its resistance to corrosion, while at the same time maintaining the high strength levels required for aircraft structural applications. For large extruded or forged parts, we have determined that the most practical process involves retrogression at 195 C for 40 minutes, followed by rapid cooling and full re-aging at 120 C for 24 hours, After an RRA treatment of a large extrusion (a three-metre section from a CC-130 sloping longeron), we measured a shrinkage of approximately 0.01S%, with minimal distortion damage. There is a small loss of strength, e.g. the RRA yield strength is typically 5 15 MPa compared to 530 MPa for the same material in the T-6 condition. The corrosion resistance measured both by exfoliation and stress corrosion cracking are significantly better than for the T-6 condition and approach that for the over-aged T-73 condition. Furthermore, the fatigue resistance and fracture toughness of RRA treated material are both within the scatter bands for the T6 condition. For many thick section extrusions and forgings, rework specifications allow for the removal of up to 10% of the material thickness to remove service-exposed corrosion damage (after which the part must be replaced). Hence, the small penalty in strength experienced after the RRA treatment is more than compensated for by improved corrosion resistance, which can eliminate the need to remove corroded material.

Author

Heat Treatment; Aluminum Alloys; Corrosion Resistance; Yield Strength; Stress Corrosion Cracking; Aircraft Structures

20000052253 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Mechanical Properties of Be-Al Alloys, *26 Dec. 1996-30 Sep. 1998*

Lee, E. U.; George, K.; Agarwala, V. V.; Sanders, H.; Feb. 22, 2000; 44p; In English

Report No.(s): AD-A375395; NAWCADPAX-99-221-TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study was conducted to define the mechanical properties of a wrought 62Be-38Al alloy and a cast 65Be-32Al-3Ni alloy. The tensile strength and elongation were measured at room temperature, 66 degrees C (150 degrees F), 121 degrees C (250 degrees F), 177 degrees C (350 degrees F), and 232 degrees C (450 degrees F). The fracture toughness was determined at room temperature. The fatigue behavior was characterized in terms of stress-life (S-N) and crack growth rate - stress intensity range (da/dN-delta K) relations at room temperature. The microstructure was examined, and the crack path was identified for each mechanical testing.

DTIC

Mechanical Properties; Aluminum Alloys; Beryllium Alloys; Cast Alloys; Wrought Alloys

20000052516 Utah Univ., Dept. of Metallurgical Engineering, Salt Lake City, UT USA
Fatigue of Bet Titanium Alloys ***Final Report, 15 Mar. 1996-14 Aug. 1999***
Ravichandran, K. S.; Mar. 2000; 74p; In English
Contract(s)/Grant(s): FE49620-96-1-0102; AF Proj. 2306
Report No.(s): AD-A375114; AFRL-SR-BL-TR-00-0078; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A comprehensive investigation of the nature of fatigue in beta titanium alloys, especially in Ti-10V-3Fe-3Al alloy, emphasizing the crack initiation and crack growth aspects in controlled microstructural conditions, was performed. A detailed survey of literature of past work in this area, was also conducted. It has been found that the fatigue limit in this alloy is independent of the size, shape and volume fraction of the primary alpha particles. The matrix condition, as determined by the aging treatment had a strong influence on the fatigue behavior. It has been found that fatigue resistance could be improved only by controlling the aging treatment, that resulted in changes in the matrix microstructure. A mysterious fatigue behavior, exhibiting dual stress versus number of cycles to failure was also found in one microstructural condition. Aging treatments that resulted in omega phase precipitation, decreased the fatigue strength. In terms of fatigue crack growth response, omega phase increased the resistance to crack growth. Additionally, a strong sensitivity of fatigue crack growth to mean stress was also found with the omega precipitation. An evaluation of fatigue behavior of various titanium alloys was also made. It was concluded that microstructural refinement led to the minimal mean stress sensitivity in conventionally aged beta alloys, in comparison to other titanium alloys. The results are discussed in the light of microstructure, electron microscopy, fractography and quantitative determination of chemistry by energy dispersive chemical analysis.
DTIC
Crack Initiation; Crack Propagation; Fatigue (Materials); Titanium Alloys

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

20000044891 Rutherford Appleton Lab., Chilton, UK
The Structure of the Polymer Electrolyte Poly(ethylene oxide)6:LiAsF6
MacGlashan, G. S., Saint Andrew's Univ., UK; Andreev, Y. G., Saint Andrew's Univ., UK; Bruce, P. G., Saint Andrew's Univ., UK; MartinyMarero, D., Rutherford Appleton Lab., UK; ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 32-33; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Polymer electrolytes consist of salts dissolved in solid high molecular weight polymers, e.g. poly(ethylene oxide) (PEO) (CH2-CH2-O)(n). They represent a unique class of solid coordination compounds. These materials hold the key to the development of truly all-solid-state rechargeable lithium batteries. It is vital to establish a knowledge of polymer electrolyte structure in order to better understand the ion transport mechanism. Crystalline polymer electrolytes are available at only a few discrete compositions. Determining the structure of the most common 3:1 and 4:1 complexes (ratio of ether oxygens to cations) has done much to shape our present understanding of polymer electrolyte structure, overturning long-held misconceptions. Reported here is the first crystal structure of a 6:1 complex which is also the most dilute complex to be determined. It is particularly important because polymer electrolyte conductivity increases markedly on changing the composition from 3:1 to 6:1. Structure solution was carried out ab initio using simulated annealing and full-profile fitting to the powder diffraction data.
Author
High Polymers; Molecular Weight; Electrolytes; Storage Batteries; Lithium Batteries; Recharging; Charge Efficiency

20000044892 Rutherford Appleton Lab., Chilton, UK
Polymorphism in Urea
Bonin, Michel, European Synchrotron Radiation Facility, France; Marshall, W. G., Rutherford Appleton Lab., UK; Weber, Hans-Peter, European Synchrotron Radiation Facility, France; Toledano, P., European Synchrotron Radiation Facility, France; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 34-35; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Subjecting simple organic molecular systems in condensed form to external constraints such as changes of temperature or pressure reveals much about the interactions between the molecular constituents. In cases where the interactions are mainly attractive, long-range van der Waals and repulsive, short-range forces, effective pairwise potentials model these interactions quite ade-

quately. In cases where hydrogen bonding is present, however, modeling techniques are not yet as successful, and experimental confirmation of the expected structures is mandatory. Urea is one example, and experiments on POLARIS using the Paris-Edinburgh pressure cell have allowed ab-initio structure determination of one of its high-pressure phases.
Author
Polymorphism; Crystal Structure; Crystallinity; Ureas; Temperature Effects; Pressure Effects; High Pressure

20000044893 Rutherford Appleton Lab., Chilton, UK
Recent Advancements in Ion Conducting Glasses
Swenson, J., Chalmers Univ. of Technology, Sweden; Matic, A., Chalmers Univ. of Technology, Sweden; Boerjesson, L., Chalmers Univ. of Technology, Sweden; Howells, W. S., Rutherford Appleton Lab., UK; ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 36-37; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

The understanding of the microscopic mechanism for ion conduction in glasses is a long-standing problem in glass science. Several properties of ion conducting glasses, such as the mixed alkali effect, the 'immobile salt effect' and the non-Arrhenius temperature dependence of the conductivity, are not well understood. In order to get a structural basis for understanding these properties we have used neutron diffraction experiments on LAD in combination with X-ray diffraction experiments for reverse Monte Carlo modelling to produce microscopic models of the complex structures of ion conducting glasses.
Author
Ion Distribution; Mobility; Transport Properties; Ion Motion; Ion Currents; Glass

20000044895 Rutherford Appleton Lab., Chilton, UK
Time for Polymer Diffusion
Bucknall, D. G., Oxford Univ., UK; Butler, S. A., Imperial Coll. of Science and Technology, UK; Higgins, J. S., Imperial Coll. of Science and Technology, UK; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 40-41; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Neutron reflectivity has proved to be a powerful method for the study of polymer diffusion, normally using a technique in which the polymers are annealed followed by rapidly frozen to suspend diffusion whilst a measurement is made. However, recent experiments on the CRISP and SURF reflectometers have shown that in-situ, real-time measurements of polymer diffusion are possible owing to the rapid data collection times at ISIS - of the order of a minute in some cases.
Author
Neutrons; Reflectance; Polymer Blends; Diffusion; Polymer Chemistry

20000044899 Rutherford Appleton Lab., Chilton, UK
Characterization of Ancient Ceramics Using Time-of-Flight Neutron Diffraction
Kockelmann, W., Bonn Univ., Germany; Pantos, E., Daresbury Nuclear Physics Lab., UK; Kirfel, A., Bonn Univ., Germany; Haehnel, E., Rheinisches Freilichtmuseum Kommern; Prag, A. J. N. W., Manchester Museum; Zhilin, M., Archaeology Inst., Russia; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 50-51; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Pottery is the fundamental yardstick used by archaeologists for dating sites or for determining trading patterns and cultural exchanges between peoples. Archaeological ceramic is widely available, but to use ceramics as markers they have to be characterized themselves. Analysis using diffraction techniques allows quantitative assessment of both the mineral phase composition of the sample and the structural properties of the individual constituents. Experiments on ROTAX have shown the ability of neutron diffraction to provide reliable information from large ceramic fragments or even a whole ceramic object.
Author
Ceramics; Neutron Diffraction; Quantitative Analysis; Minerals

20000045692 NASA Langley Research Center, Hampton, VA USA
Molded Magnetic Article
Bryant, Robert G., Inventor, NASA Langley Research Center, USA; Namkung, Min, Inventor, NASA Langley Research Center, USA; Wincheski, Russell A., Inventor, NASA Langley Research Center, USA; Fulton, James P., Inventor, NASA Langley Research Center, USA; Fox, Robert L., Inventor, NASA Langley Research Center, USA; Apr. 25, 2000; 8p; In English; Provisional application of US-Patent-Appl-SN-015154, filed 10 Apr. 1996
Patent Info.: Filed 9 Apr. 1997; NASA-Case-LAR-15463-1; US-Patent-6,054,210; US-Patent-Appl-SN-846505; US-Patent-Appl-SN-015154; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A molded magnetic article and fabrication method are provided. Particles of ferromagnetic material embedded in a polymer binder are molded under heat and pressure into a geometric shape. Each particle is an oblate spheroid having a radius-to-thickness aspect ratio approximately in the range of 15-30. Each oblate spheroid has flattened poles that are substantially in perpendicular alignment to a direction of the molding pressure throughout the geometric shape.
Author
Technology Assessment; Binders (Materials); Oblate Spheroids; Ferromagnetic Materials; Fabrication; Embedding

20000045698 NASA Langley Research Center, Hampton, VA USA
Reflective Silvered Polyimide Films Via In Situ Thermal Reduction Silver (I) Complexes
Southward, Robin E., Inventor, NASA Langley Research Center, USA; Thompson, David W., Inventor, NASA Langley Research Center, USA; St.Clair, Anne K., Inventor, NASA Langley Research Center, USA; Stoakley, Diane M., Inventor, NASA Langley Research Center, USA; Feb. 01, 2000; 4p; In English; Provisional application US-Patent-Appl-SN-037959, filed 20 Feb. 1997 Patent Info.: Filed 20 Feb. 1998; NASA-Case-LAR-15638-1; US-Patent-6,019,926; US-Patent-Appl-SN-026591; US-Patent-Appl-SN-037959; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Self-metallizing. flexible polyimide films with highly reflective surfaces are prepared by an in situ self-metallization procedure involving thermally initiated reduction of polymer-soluble silver(I) complexes. Polyamic acid solutions are doped with silver(I) acetate and solubilizing agents. Thermally curing the silver(I) doped resins leads to flexible. metallized films which have reflectivities as high as 100%. abrasion-resistant surfaces. thermal stability and, in some cases, electrical conductivity, rendering them useful for space applications.
Author
Reflectance; Polyimides; Silver; Metal Films; Technology Utilization; Thermal Stability

20000045998 NASA Langley Research Center, Hampton, VA USA
Pressure-Sensitive Paint and Video Model Deformation Systems at the NASA Langley Unitary Plan Wind Tunnel
Erickson, G. E., NASA Langley Research Center, USA; Burner, A. W., NASA Langley Research Center, USA; DeLoach, R., NASA Langley Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 509-542; In English; See also 20000045988; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Pressure-sensitive paint (PSP) and video model deformation (VMD) systems have been installed in the Unitary Plan Wind Tunnel at the NASA Langley Research Center to support the supersonic wind tunnel testing requirements of the High Speed Research (HSR) program. The PSP and VMD systems have been operational since early 1996 and provide the capabilities of measuring global surface static pressures and wing local twist angles and deflections (bending). These techniques have been successfully applied to several HSR wind tunnel models for wide ranges of the Mach number, Reynolds number, and angle of attack. A review of the UPWT PSP and VMD systems is provided, and representative results obtained on selected HSR models are shown. A promising technique to streamline the wind tunnel testing process, Modern Experimental Design, is also discussed in conjunction with recently-completed wing deformation measurements at UPWT.
Author
Paints; Sensitivity; Wind Tunnel Tests; Experiment Design; Pressure Measurement; Video Equipment; Deformation

20000046570 Kansas City Plant, Kansas City, MO USA
High Breakdown Strength, Multilayer Ceramics for Compact Pulsed Power Applications
Gilmore, B., Kansas City Plant, USA; Huebner, W., Kansas City Plant, USA; Krogh, M. L., Kansas City Plant, USA; Lundstrom, J. M., Kansas City Plant, USA; Pate, R. C., Kansas City Plant, USA; Jul. 20, 1999; 8p; In English; 12th; 12th International Pulsed Power Conference, 27-30 Jun. 1999, Monterey, CA, USA
Report No.(s): DE00-009051; KCP-613-6212; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Advanced ceramics are being developed for use in large area, high voltage devices in order to achieve high specific energy densities (>10 6 J/cu m) and physical size reduction. Initial materials based on slip cast TiO2 exhibited a high bulk breakdown strength (BDS >300 kV/cm) and high permittivity with low dispersion (e100). However, strong area and thickness dependencies were noted. to increase the BDS, multilayer dielectric compositions are being developed based on glass/TiO2 composites. The addition of glass increases the density (99.8% theoretical), forms a continuous grain boundary phase, and also allows the use of high temperature processes to change the physical shape of the dielectric. The permittivity can also be manipulated since the volume fraction and connectivity of the glassy phase can be readily shifted. Results from this study on bulk breakdown of TiO2 multilayer structures with an area of 2sq cm and 0.1 cm thickness have measured 650 kV/cm. Furthermore, a strong

dependence of breakdown strength and permittivity has been observed and correlated with microstructure and the glass composition. This paper presents the interactive effects of manipulation of these variables.
NTIS
Ceramics; Pulse Generators; Ceramic Coatings; Flux Density; Microstructure; Mechanical Properties

20000046602 Department of the Navy, Washington, DC USA
Phase Stabilization of Zirconia
Provenzano, Virgil, Inventor; Holtz, Ronald L., Inventor; Lewis, David, Inventor; Dec. 28, 1999; 4p; In English; Supersedes US-Patent-Appl-SN-08791292
Patent Info.: Filed 30 Jan. 1997; US-Patent-Appl-SN-08,791,292; US-Patent-6,007,926
Report No.(s): AD-D019655; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Stabilized zirconia containing sintered particles of alumina and zirconia in tetragonal phase at temperatures below about 1150 deg C. is prepared by mixing alumina particles of less than 30 nanometers with zirconia particles of less than 30 nanometers in presence of a liquid to form a suspension, drying the suspension at a temperature up to about 6000 deg C. to remove the liquid and products thereof to form a dried suspension composed of agglomerated alumina and zirconia particles, sintering the dried suspension to fuse the particles, and cooling the sintered dried suspension to an ambient temperature to produce free-standing bodies or coatings on substrates.
DTIC
Stabilization; Phase Stability (Materials); Phase Transformations; Zirconium Oxides; Ceramic Coatings

20000047284 Norwegian Defence Research Establishment, Div. for Environmental Toxicology, Kjeller, Norway
Contamination from Marine Paints: A Norwegian Perspective
Johnsen, Arnt, Norwegian Defence Research Establishment, Norway; Engoy, Thor, Norwegian Defence Research Establishment, Norway; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 23-1 - 23-6; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Marine paints have been used for over 100 years to protect ships from weathering and biological and chemical degradation. In order to obtain the right marine paint quality various substances increasing the anticorrosive, antifouling, mechanical flexibility, weatherability, chemical and cold resistance properties were added. Many of the additives that have been used and are still being used today are toxic compounds for man and other species. Spills of paint residues and leakage from painted objects will eventually be deposited in the sea sediments and will therefore potentially pose a threat to the marine environment. Biocides and various other additives used in antifouling paints seem to give the most serious problems ranked according to impact on marine life. Antifouling paints are designed to give a thin boundary layer in the water around the hull were the concentration of antifouling agent is high enough to kill algae and other organisms that would otherwise remain attached to the hull. With the water acting as a sink, there will therefore need to be a continuous release of toxic compounds from the hull. These compounds have high affinity to particles in the water column and will therefore quickly settle on the seabed. Contaminated sediment will subsequently be a source for resuspension or dissolution in the water column or a direct source for bottom feeders. In Norway a majority of harbours and areas adjacent to main ship repair yards have highly contaminated sediments. This has resulted in elevated levels of toxic compounds in fish and shellfish living in these waters and guidance on their consumption has been issued by the Norwegian Food Control Authority. In many cases the prime concern is the elevated levels of PCBs (Poly Chlorinated Biphenyls). At Haakonsvem Naval Base the Norwegian Defence Construction Service has commenced actions to remove contaminated sediment. The sources of some of these contaminants, such as TBT (tributyltin) have been firmly established to be antifoulants due to its unique application. However other contaminant sources remain elusive, such as PCBs, in part due to the mixing of multiple source signals over a period of several decades, in part due to the limited accessibility of the composition of historical and contemporary marine paints. An investigation into the link between contaminant concentration in sediments at Haakonsvem Naval Base and the use of marine paints is presented here.
Author
Marine Environments; Environment Protection; Paints; Sediments; Ship Hulls; Pollution Control

20000047286 Army Armament Research, Development and Engineering Center, Industrial Ecology Center, Picatinny Arsenal, NJ USA
Environmentally Compatible Coating Removal for Weapon Systems
Zanowicz, Robert, Army Armament Research, Development and Engineering Center, USA; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 26-1 - 26-14; In English; See also 20000047263; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The U.S. Department of Defense's depot and sustainment activities produces large amounts of hazardous waste each year in the re-furbishment of all types of military equipment. These include but are not limited to tanks, combat ground vehicles, ships, aircraft and their associated armament. Budgets for new materiel acquisition in all the services have dropped substantially since the early 1990s and services are committed to holding on to their existing inventories of equipment. In one example, the Air Force B-52 Bomber will remain in service until the 2030's, extending its life cycle to over 90 years. Right now the U.S. is postured in a position to maintain its aging inventory of legacy system equipment. There is no doubt that many pieces of equipment will go through many Rework cycles until it is placed in surplus. Coupled to the fact that since the end of the Cold War, the U.S. Military has been subject to stringent air and water pollution control through legislation and executive order. The military services which operate the shipyards, air logistics centers and depots now face the two fold challenge of a vastly increased workload and much stricter environmental guidelines of which to operate. In addition, many Government Owned, Government Operated depots face endless cost cutting challenges from outsourcing in the private sector to remain open. Many of these maintenance operations involve paint stripping and re-painting of vehicles and aircraft. Other operations involve coating removal of inorganic coatings such as those in engines and other assemblies such as landing gear. For example, it is estimated that 80% of the Air Force hazmats are created by painting and de-painting operations alone. Both the Army and the Navy employ extensive means to their painting and stripping operations. These until recently involve conventional means of paint stripping and coating removal that involve chemical and mechanical means. Chemical means using methylene chloride requires elaborate compliance means such as air emissions controls and filtering systems. Occupational health and safety issues are also considered in that personnel must wear protective equipment and receive the proper Hazmat training. In addition, permits must be obtained and inspections by many state agencies in which the depots operate. Another important point is that many states, in this case California has air emission standards that are far stricter than Federal ones. This is especially true of the SouthCoast Air Emission Standards around the Los Angeles basin and also further south in San Diego. For example, it not uncommon to for the Marines to move trucks and equipment to a neighboring states to strip and paint these vehicles. Again this takes additional time and will increase costs of operations. Hazmats must be stored, cataloged and disposed of properly. Depots are subject to inspections and must comply with paperwork and all this adds up to increased costs of operation. The traditional approach to the environment is to focus on complying with the law and to clean up wastes that were generated throughout the years. All of this is fine but it can be somewhat shortsighted in that all things being equal, unless one changes the process, hazardous materials will continue to be generated. In short, compliance and clean up costs will always remain if not grow due to future legislation. The key is in source reduction by initial elimination or reduction of chemicals. Solutions must also go beyond the environmental compliance issues in that they must make economic sense and have relatively short payback periods.
Derived from text
Paint Removal; Weapon Systems; Pollution Control; Military Operations; Protective Coatings; Hazardous Materials

20000047295 Defence Evaluation Research Agency, Mechanical Sciences Sector, Farnborough, UK
Advances in Protective Coatings and their Application to Ageing Aircraft
Smith, C. J. E., Defence Evaluation Research Agency, UK; Higs, M. S., Defence Evaluation Research Agency, UK; Baldwin, K. R., Defence Evaluation Research Agency, UK; New Metallic Materials for the Structure of Aging Aircraft; April 2000, pp. 15-1 - 15-8; In English; See also 20000047290; Copyright Waived; Avail: CASI; A02, Hardcopy

Significant improvements have been achieved in the performance of coatings used in the corrosion protection of military and civil aircraft during the last thirty years. Research into aircraft paints, for example, has resulted in coatings with increased adhesion, fluid resistance and greater flexibility. New methods of paint stripping and novel processes for the repair of pre-treatments and metal coatings are being developed which will lead to reductions in the cost of corrosion maintenance and improved levels of protection. The paper reviews recent developments in aerospace coatings and considers their application in ameliorating some of the corrosion problems associated with ageing aircraft.
Author
Protective Coatings; Aging (Materials); Corrosion Prevention; Metal Coatings; Maintenance; Civil Aviation

20000047451 Department of Energy, Office of Energy Research, Washington, DC USA
Study of (alpha)-particle injection effect on superconductors YBa2 Cu3O7(-)(delta)) type
Santos, G. R.; Leal, L. C.; Dec. 31, 1998; 9p; In English; Physics of nuclear science and technology
Report No.(s): DE98-007159; ORNL/CP-98820; No Copyright; Avail: Department of Energy Information Bridge

Various techniques exist to qualify and quantify this radiation damage effect. The methods are based on destructive methods such as TEM, SEM, CREEP and others. This work is intended to be a starting point to the application of nondestructive techniques to study radiation damage in superconductors in nuclear application, and a creation of a nuclear data bank for different type of materials. The first scheduled nondestructive technique to be applied is positron annihilation, more specifically positron lifetime

measurements. This work is based on the implementation of a technique, widely used to simulate neutron radiation effects on materials. This simulation is obtained by the injection of charged particles (ions), from an accelerator, and a beam line equipped with some special experimental arrangement to get a homogeneous distribution of injected particles in the sample. After the ion injection, or neutron damage simulation, the nuclear data are collected by different experimental setups: conventional gamma spectrometer for activation analysis, X-ray diffraction for phase change analysis, and zero detector for magnetic permeability measurements. The behavior of the magnetic permeability with temperature of YBa2Cu3O7(-)(delta)) superconducting ceramics was studied as a function of the amount of He(sup (-2) implanted into the sample. With fluence varying from 1.2 to 6.0 x 10(exp 6) He(sup (-2) cm(exp -2), the results show that the superconducting temperature T(sub c)(onset) stays nearly constant up to 2.5 x 10(exp 6) He(sup (-2) cm(exp (-2), decreasing afterwards for higher fluencies. An almost linear decrease is observed for T(offset). The magnetic permeability curves show structures whose shapes and relative positions to T(sub c)(onset) change with the fluence. Although this might indicate a mixture of phases coexisting inside the sample, X-ray diffraction shows no clear evidence for such a pattern. A large percentage of the damage recovers after annealing the He-implanted sample at 673 K.
NTIS
Injection; Alpha Particles

20000048280 National Oceanic and Atmospheric Administration, Pacific Marine Environmental Labs., Seattle, WA USA
Effects of Weathering on the Flammability of Oils ***Final Report***
Jones, Robert K.; Sep. 1999; 52p; In English
Contract(s)/Grant(s): DTCG39-98-XE00266
Report No.(s): AD-A376001; CG-D-04-00; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Many crude oils and fuel oils are flammable and pose a significant fire hazard if not handled properly. When an oil is accidentally spilled and exposed to the environment, the flammability characteristics of the oil can change significantly as it evaporates. A numerical weathering model that simulates the weathering and consequent changes in flammability was developed. The time required for a representative group of flammable oils to weather to a non-flammable state under various spill conditions was estimated. The effects of the level of mixing caused by environmental factors were closely examined. Results of simulations indicate that flammable crude oils weather very slowly when there are no natural mixing mechanisms at work. In these cases weathering times are very sensitive to the thickness of the oil. In contrast, if there are effective mechanisms for mixing the oil, it weathers much more quickly and the weathering time is less sensitive to thickness. Simulations indicate that flammable fuel oils are less likely to become non-flammable during weathering. Weathered gasoline remains flammable until it is almost completely evaporated.
DTIC
Weathering; Flammability

20000048624 Department of the Navy, Washington, DC USA
Single-Crystal Material on Non-Single-Crystalline Substrate
Hobart, Karl D., Inventor; Kub, Francis J., Inventor; Feb. 01, 1999; 25p; In English
Patent Info.: Filed 1 Feb. 1999; US-Patent-Appl-SN-09,243,182
Report No.(s): AD-D019623; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A method for making a multilayered structure with a single crystal film bonded to a polycrystalline substrate has the steps of bonding a single crystal film to a polycrystalline substrate; and growing an epitaxial layer on said single crystal film bonded to said polycrystalline substrate.
DTIC
Single Crystals; Thin Films; Bonding; Polycrystals; Substrates; Crystal Structure; Epitaxy

20000048641 Osaka Univ., Faculty of Engineering, Osaka, Japan
Surface Relief Grating Formation on Composite Thin Film of Conducting Polymer and Polyacrylate Containing Azo-Chromophores and Its Emission Characteristics
Ozaki, Masanori, Osaka Univ., Japan; Nagata, Taisuke, Osaka Univ., Japan; Yoshino, Katsumi, Osaka Univ., Japan; Kajzar, Francois, Centre des Etudes Nucleaires de Saclay, France; Technology Reports of the Osaka University; Apr. 15, 2000; ISSN 0030-6177; Volume 50, No. 2368, pp. 19-25; In English; Copyright; Avail: Issuing Activity

The formation of photo-induced surface relief grating on a composite film of conducting polymer and acrylate polymer containing azo-substituent has been studied. ne diffraction efficiency of photo-induced grating decreases with increasing concentration of conducting polymer with respect to the polyacrylate in the concentration range higher than 3 %, This implies that the height of surface relief on the film lowered upon doping conducting polymer, which has been confirmed by an atomic force microscope

observation. It has been found, however, that the formation of surface relief is promoted by slightly doping conducting polymer (less than 3 %) and progresses even after stopping irradiation of the laser light. Anomalous angular dependence of photoluminescence from the composite film having relief grating on it has also been found.
Author
Photoluminescence; Surface Properties; Thin Films; Azo Compounds; Conducting Polymers

20000048647 Osaka Univ., Faculty of Engineering, Osaka, Japan
Effect of Hydrogen Atmosphere on the Radiation-Induced Crosslinking of Polystyrene
Ema, Kimiko, Osaka Univ., Japan; Nagatomi, Ken, Osaka Univ., Japan; Izumi, Yoshinobu, Osaka Univ., Japan; Technology Reports of the Osaka University; Apr. 15, 2000; ISSN 0030-6177; Volume 50, No. 2377, pp. 93-98; In English; Copyright; Avail: Issuing Activity

Mono-dispersed polystyrene in 1 MPa hydrogen atmosphere was irradiated by Co-60 gamma-rays at an ambient temperature. The crosslinked products were analyzed by means of gel permeation chromatography (GPC), and we found that G-value of crosslinking in hydrogen atmosphere was smaller than that in vacuum. The reaction mechanism of hydrogen with polystyrene by gamma-radiolysis was discussed.
Author
Hydrogen; Atmospheric Effects; Irradiation; Polystyrene; Organic Materials; Crosslinking; Cobalt 60

20000050216 Department of Energy, Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC USA
Vitreous bond CBN high speed and high material removal rate grinding of ceramics
Shih, A. J.; Grant, M. B.; Yonushonis, T. M.; Morris, T. O.; McSpadden, S. B.; Dec. 31, 1998; 6p; In English; American Society of Precision Engineering conference
Report No.(s): DE98-007184; ORNL/CP-98717; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

High speed (up to 127 m/s) and high material removal rate (up to 10 mm(sup 3)/s/mm) grinding experiments using a vitreous bond CBN wheel were conducted to investigate the effects of material removal rate, wheel speed, dwell time and truing speed ratio on cylindrical grinding of silicon nitride and zirconia. Experimental results show that the high grinding wheel surface speed can reduce the effective chip thickness, lower grinding forces, enable high material removal rate grinding and achieve a higher G-ratio. The radial feed rate was increased to as high as 0.34 (micro)m/s for zirconia and 0.25 (micro)m/s for silicon nitride grinding to explore the advantage of using high wheel speed for cost-effective high material removal rate grinding of ceramics.
NTIS
Grinding (Material Removal); Ceramics; Grinding Machines

20000050477 Case Western Reserve Univ., Cleveland, OH USA
Determination of the Peltier Coefficient for Gallium Arsenide in a Vertical Bridgman Furnace
Wiegel, Michaela E. K., Case Western Reserve Univ., USA; Matthiesen, David H., Case Western Reserve Univ., USA; [1999]; 19p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Peltier coefficient for gallium arsenide solid in contact with its melt was experimentally determined. Selenium doped gallium arsenide samples were hermetically sealed in a fused quartz ampoule and processed in a vertical Bridgman furnace. During the translation period seven sequences of current-on and current-off periods were processed into the solidifying crystal. An axial slice was mechanochemically polished and then etched. Photomicrographs of the slice that were taken with differential interference contrast microscopy and were used to measure the thickness of the current-on and current-off layers. These results were used to calculate growth rates from which the Peltier coefficient was calculated. An average value of 0.107 +/- 0.015 V was determined. The values calculated from the different sequences were in excellent agreement with each other even though the sequences had different current densities, current-on durations, and current-on to current-off ratios.
Author
Peltier Effects; Gallium Arsenides; Bridgman Method; Furnaces; Experimentation; Solidification

20000052129 Systran Corp., Dayton, OH USA
High Performance Flat Coatings Through Compatibilized Immiscible Polymer Blends ***Final Report, Nov. 1998 - Jul. 1999***
Fabish, T. J.; Lynn, W. F.; Passinault, R. J.; Vreugdenhil, A.; Metz, B.; Jul. 1999; 87p; In English
Contract(s)/Grant(s): F33615-94-C-5804; AF Proj. 4347
Report No.(s): AD-A375878; AFRL-ML-WP-TR-1999-4140; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

A new approach to high performance ultra low gloss aircraft coating systems is described based on compatibilized immiscible blends of two polyols that differ significantly in surface energy. Extensive characterization measurements show the performance

of the polymer alloy systems surpasses existing benchmark polyurethane and fluoropolymer topcoat systems in hardness, chemical resistance, fluid resistance, abrasion resistance, and cleanability. The superior performance in screening tests is attributed to a favorable synergism between the parent homopolymers that is enabled by the stress bearing interface and morphology peculiar to an alloy. A method is explored for connecting a standard coating screening test to the more fundamental linear response coefficients measured in thin film dynamic mechanical analysis (DMA). An extension is proposed aimed at utilizing the thermodynamic drive arising from the difference in component surface energies to assemble pigments in threadlike fashion through one polymer phase to prescribe effective medium optical properties at minimal pigment loading.
DTIC
Polymer Blends; Protective Coatings

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PROPELLANTS AND FUELS

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

20000046724 Department of the Navy, Washington, DC USA
Liquid Propellant
Wagaman, Kerry L., Inventor; Oct. 26, 1999; 5p; In English; Supersedes US-Patent-Appl-SN-08854031
Patent Info.: Filed 9 May 1997; US-Patent-Appl-SN-08,854,031; US-Patent-5,972,136
Report No.(s): AD-D019648; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A liquid oxidizer for propellants or explosives comprising nitric acid (HNO3), ammonium nitrate (NH4NO3), and water.
DTIC
Rocket Oxidizers; Liquid Rocket Propellants; Liquid Fuels; Explosives

20000047276 Rheinmetall G.m.b.H., Duesseldorf, Germany
Conversion of High Explosives
Wanninger, P., Rheinmetall G.m.b.H., Germany; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 14-1 - 14-30; In English; See also 20000047263; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Military high explosives are realized to provide a propellant (propulsion) or a destructive effect (detonation) in munition. High explosives, rocket propellants or propellant powders hardly ever contain pure high explosives. Normally there are mixtures which have to be split up into their individual components when preparing them for conversion. This is relatively simple in the case of high explosive charges and still feasible for single base propellants but very difficult for double base propellants as they are available in form of solid propellant mixtures. Dissolving and separation of such propellants are very expensive and take much time. An affordable and short-term solution to destroy the high explosives of unexploded ordnance is burning them.
Derived from text
Explosives; Ordnance; Propellants; Combustion; Waste Disposal

20000047277 Ministry of Defence, International Relations Dept., Riga, Latvia
Latvian Approach to the Environmental Issues in the Military Area and Unexploded Ordnance
Gulbis, Andris, Ministry of Defence, Latvia; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 15-1 - 15-36; In English; See also 20000047263; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Following 5 decades since the World War II Latvia being occupied sequentially by Nazi and Soviet military powers suffered much from their military presence causing and activating also environmental problems into the places of direct location of German and Soviet troops and their military camps. Extremely high density of former Soviet military units and institutions in Latvia (approx. 700) caused the situation that a lot of dangerous explosives, anti-personnel mines, different emissions, damaged and defected ammunition, other hazardous materials are still polluting vast Latvian rural territories the clearance and neutralisation of whom still challenge the Government being unable to allocate resources sufficient to these needs. Also problems concerning polluted water and soil in former Soviet military sites are not solved yet, then the storage and neutralisation of hazardous waste

including dangerous chemicals, petroleum based compounds, rocket fuel, huge stocks of municipal waste left by Soviet army units, polluted sites in Liepaja former military seaport area etc.
Derived from text
Hazardous Materials; Hazardous Wastes; Environment Protection; Environmental Cleanup; Ordnance; Waste Disposal; Latvia

20000047289 Pyrotechnik Silberhutte G.m.b.H., Silberhuette, Germany
Disposal of Pyrotechnic Illuminating and Signalling Ammunition
Groeger-Schlink, Martin, Pyrotechnik Silberhutte G.m.b.H., Germany; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 31-1 - 31-18; In English; See also 20000047263; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Pyrotechnic illuminating and signalling ammunition is subject to natural aging because of the chemical behavior of the used pyrotechnic compositions and sub-assemblies. For this reason the durability is limited and the use for its purpose is not longer possible because of the safety aspects. From the substance properties of the pyrotechnic compositions in illuminating and signalling ammunition starting points are given which lead the disposal to an environmental friendly, extensive recycling of materials. Started from a short description of the design of illuminating and signalling ammunition and the disposal task the practicise disposal processes are demonstrated in a general view. The exemplary disposal of pyrotechnic ammunitions in the plant of a German enterprise demonstrates the manifold problems and their solution at the completion of a contract for disposal. by means of real measurement results for the emission situation the requirements of the environment protection, the approval process according to the German law and the experiences from the operation of the plant are explained. A special attention is drawn to the engineering solution as well as the measuring technique in context with the emission control. Finally, a view is given to the actual problems of the disposal of illuminating and signalling ammunition.
Author
Environment Protection; Pyrotechnics; Waste Disposal; Recycling; Pollution Control

20000051494 Dayton Univ. Research Inst., Research Inst., OH USA
Fuel and Fuel System Materials Compatibility Test Program for a JP-8+100 Fuel Additive. Volume 1. Betzdearborn Spec-Aid 8Q462 Thermal Stability Additive Package ***Final Report, 1 Jan. 1992-1 Jan. 1999***
Kalt, D. H.; Zabarnick, S.; Anderson, S. D.; Liberio, P. D.; Mar. 1999; 79p; In English
Contract(s)/Grant(s): F33615-92-C-2207; AF Proj. 3048
Report No.(s): AD-A375824; AFRL-PR-WP-TR-2000-2021; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report describes a program to test the compatibility of aircraft fuel system materials with a JP-8 fuel containing a new thermal stability additive package. The JP-8 fuel containing this new additive package is commonly referred to as JP-8+100. The ”+100” refers to the expected 100 degree F increase in thermal stability range of the fuel containing the additive over the thermal stability range of JP-8 fuel. In this test report, the effects of fuel containing BetzDearborn Spec-Aid 8Q462 additive package on aircraft fuel system’s materials. The BetzDearborn Spec-Aid 8Q462 fuel additive package incorporates a dispersant, a metal deactivator, and an antioxidant compound. These compounds reduce the rate of oxidation and/or inhibit the formation of bulk and surface deposits at higher temperatures.
DTIC
Aircraft Fuel Systems; JP-8 Jet Fuel; Oxidation; Additives

20000051542 Politecnico di Milano, Dipt. di Energetica, Milan, Italy
SOLID PROPELLANT COMBUSTION STABILITY BY LASER RADIATION MODULATION
Cozzi, Fabio, Politecnico di Milano, Italy; Balasini, Andrea, Politecnico di Milano, Italy; DeLuca, Luigi T., Politecnico di Milano, Italy; Hessler, Richard O., Hessler (R. O.), USA; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 5-1 - 5-14; In English; See also 20000051537
Contract(s)/Grant(s): ASI-ARS-96-130; Copyright Waived; Avail: CASI; A03, Hardcopy

The solid propellant pressure-driven combustion response, needed for motor stability analysis, can be deduced from laser recoil experiments through an analytical relationship. Although experimental and theoretical issues exist yet to be resolved, the laser recoil technique is promising because of speed and cost advantages over current T-burner techniques. Results obtained for two composite and one double-base propellants at ambient pressure are reported.
Author
Solid Propellant Combustion; Combustion Stability; Laser Beams

20000051544 Allegany Ballistics Lab., Rocket Center, WV USA

Insensitive Munitions Technology for Small Rocket Motors

Hartman, K. O., Allegany Ballistics Lab., USA; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 12-1 - 12-8; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

The characteristics and properties of small rocket motors based on HTPE propellants in composite cases are discussed. Based on the extensive work to date, this system provides a viable approach to the development of IM compliant motors that meet performance requirements for future tactical weapons. The HTPE propellants loaded in graphite composite cases pass IM tests for slow cookoff, fast cookoff, fragment impact and bullet impact when tested in both five-inch and ten-inch generic motors. They significantly reduce the severity of the response to energetic stimuli in prototype ten-inch motors. HTPE propellants have comparable performance (impulse and density) to hydroxyterminated polybutadiene (HTPB) propellants, as confirmed by static firings of prototype motors. HTPE propellants have been extensively characterized and have excellent mechanical properties, aging behavior as well as burn rate; pressure exponent and temperature sensitivity. They have been manufactured and characterized through the 600 gallon mix scale. Also, they have been successfully developed and demonstrated in a major motor development program. Author

Sensitivity; Weapons Industry; Military Technology; Rocket Engines

20000051550 Societe Nationale des Poudres et Explosifs, Vert-Le-Petit, France

New Generation of Propellants for High Performance Solid Rocket Motors

Longevialle, Y., Societe Nationale des Poudres et Explosifs, France; Golfier, M., Societe Nationale des Poudres et Explosifs, France; Graindorge, H., Societe Nationale des Poudres et Explosifs, France; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 25-1 - 25-11; In English; See also 20000051537; Copyright Waived; Avail: CASI; A03, Hardcopy

The main operational trends for rocket motor future applications are: to reach improved performances, to satisfy insensitive munitions requirements, to comply with environmental aspects, and to reduce costs. These requirements cannot be met with current propellants. In order to fit these requirements, SNPE develops new generation of propellants, containing new molecules. SNPE has been working many years in the field of novel energetic materials, connecting research works with applications needs. Currently the most important effort concerns azidopolymers such as GAP and derivatives, and new oxidizers such as ADN and HNIW. These new energetic ingredients bring high energy to rocket propellants, burn by themselves faster than the conventional ones, and are available at industrial or pilot scale, for some of them. Propellants using these new raw materials lead to high energetic performances. They give profit in the ratio performance/safety behavior. Today, mechanical properties satisfying a large range of operational applications are achieved and, the obtained ballistic properties cover a significant part of the needs of rocket motors designers.

Author

High Energy Propellants; Solid Propellant Rocket Engines; Performance Tests

20000051552 Office National d'Etudes et de Recherches Aerospatiales, Dept. DEFA, Palaiseau, France

New Fluorinated Binder Solid Propellants for Controllable Rocket Motors, Solid Fuel Ramjets and Ducted Rockets

Fourest, B., Office National d'Etudes et de Recherches Aerospatiales, France; Masson, C., Office National d'Etudes et de Recherches Aerospatiales, France; Vigot, C., Office National d'Etudes et de Recherches Aerospatiales, France; Perut, C., Societe Nationale des Poudres et Explosifs, France; Cristofoli, B., Societe Nationale des Poudres et Explosifs, France; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 27-1 - 27-14; In English; See also 20000051537; Copyright Waived; Avail: CASI; A03, Hardcopy

ONERA and SNPE have developed a new highly fluorinated binder (fluorine content is greater than = 50%) with high density (d is greater than = 1.7). This binder could be used to make various energetic materials : Reactive Armor, solid propellants with high-pressure deflagration limit (Pdl), fuel rich solid propellants for ducted rocket and ramjet solid fuels. The chemical nature of this binder (high proportion of fluorine and oxygen) used with an ammonium perchlorate loading (70 is less than or equal to AP is less than or equal to 79%), is interesting to obtain oxidizing solid propellants which have high-pressure deflagration limits (1 is less than or equal to Pdl is less than or equal to 3 MPa). In association with a fuel-rich gas generator, it is possible to conceive controllable rocket motors. The fuel-rich gas is injected in the fluorinated propellant motor through a valve which controls the ignition of the grain and the different stages of the motor thrust. A great number of tests has been successfully performed to demonstrate the real interest of this propulsion system. Fluorinated binders also improve the combustion efficiency of boron and boron carbide in airbreathing combustion chambers. Combustion mechanism studies of fluorinated binder with fuel filler have shown the very strong reactivity of this binder with metals like magnesium and aluminium. New solid fuels and fuel-rich propellants have been developed with fillers of metallic powder mixtures. These compositions have high ablation rates and adapted burning rates

for unchoked gas generator with radial grain (”rustique” ducted rocket). This paper describes basic studies (e.g. combustion mechanism) performed and possibilities to use this new generation of energetic materials in these two domains of propulsion.
Author
Fluorine; Solid Rocket Binders; Fillers; Ducted Rocket Engines; Ramjet Engines; Rocket Engine Control; Solid Propellants

20000051553 Politecnico di Milano, Facolta di Ingegneria, Milan, Italy
Ignition Transients of Solid Propellants Including Temperature-Dependent Thermophysical Properties
Galfetti, L., Politecnico di Milano, Italy; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 29-1 - 29-12; In English; See also 20000051537; Copyright Waived; Avail: CASI; A03, Hardcopy

Experimental and numerical studies of the ignition of Ammonium Perchlorate propellants were performed under different operating conditions, including convective and radiant heating sources. in this paper attention is given to the numerical approach; very useful suggestions for the design of new propellants and the design of the propulsion system can be obtained. The mathematical formulation of the problem is based on a frame of reference fixed to the burning surface and the propellant sample can be considered semi-infinite (length of the propellant specimen much larger than the characteristic thermal wave thickness in the condensed phase). to optimize (lie computation a scale transformation that maps the semi-infinite domain into a finite region is considered. The mathematical model retains the QSHOD assumption; surface gasification is assumed of a generalized Arrhenius type; the condensed phase is supposed chemically reacting; surface reflectivity and optical transparency of the condensed phase are also investigated. Attention is focused on the effects of the thermophysical properties which are assumed to be temperature dependent. This detailed treatment of the condensed phase can give important instructions to solid rocket designers. Numerical results obtained by the model are compared with experimental ignition results for the effect of the heating flux and pressure on ignition times.
Author
Solid Propellant Ignition; Ignition Temperature; Ammonium Perchlorates; Solid Rocket Propellants; Temperature Dependence; Temperature Effects; Thermophysical Properties

20000051554 Coimbra Univ., Lab. de Energetica e Detonica, Coimbra, Portugal
CLEAN PROPELLANTS BASED ON PSAN/DNAM
Simoes, P., Coimbra Univ., Portugal; Pedroso, L., Coimbra Univ., Portugal; Portugal, A., Coimbra Univ., Portugal; Portugal, A., Coimbra Univ., Portugal; Nina, M., Instituto Superior Tecnico, Portugal; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 30-1 - 30-9; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

The development of new CHNO propellant compositions, free of Cl and F, is nowadays a basic challenge for a clean environment. PSAN (Phase Stabilised Ammonium Nitrate) is always a potential filler for composite compositions. It is stable at normal conditions, presents a fairly good oxygen balance and its deflagration-detonation needs large values for critical diameter. Nevertheless its hygroscopicity, phase transitions and its burning characteristics are not negligible drawbacks compared to the standard AP (Ammonium Perchlorate). The searching for new CHNO molecules in order to increase the energetic of the basic PSAN composition led us to synthesize DNAM (dinitroammeline, 2-oxy-4,6-dinitramine-s-triazine). DNAM characteristics show fairly attractive density, thermal stability properties over a wide temperature range and low sensitivity, both to impact and friction. The present paper describes the synthesis of DNAM to its incorporation in a propellant formulation based on PSAN and Hydroxy-terininated-Polybutadiene (HTPB). This included the characterization of DNAM, theoretical assessment of performance characteristics and thermodynamics properties of its combustion products, obtained using THOR and CET89 computer codes, regression rate measurements and small-scale shock sensitivity tests by using a new procedure developed in our laboratory. The overall results of this study confirm the potential of DNAM in propellant formulations.
Author
Chemical Reactions; Clean Fuels; Synthetic Fuels; Chemical Fuels; Propellants; Propellant Chemistry; Synthesis (Chemistry); Ammonium Nitrates

20000051558 TRW Space Technology Labs., Redondo Beach, CA USA
Gelled Propellants for Tactical Missile Applications
Hodge, K. F., TRW Space Technology Labs., USA; Crofoot, T. A., TRW Space Technology Labs., USA; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 40-1 - 40-7; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

There exists a family of gelled hypergolic propellants which have been shown to meet insensitive munitions requirements, can be stored and fired with existing propulsion technology, and are inherently safer than either neat liquid propellants or any

known solid propellant system due to their unique viscosity and chemical characteristics. Gelled propellants provide comparable density impulse to the most capable solid propellant systems while delivering the mission duty cycle flexibility of a liquid system and meeting Insensitive Munitions (IM) requirements - an achievement which no current solid propulsion system has been able to equal, A gelled bipropellant propulsion system provides exceptional mission flexibility by permitting on-off modulation and/or continuous throttling of thrust during missile time-of-flight. When combined with advanced seekers, G&C electronics and (optional) in-flight command targeting updates, a ”smart” mission capability is achieved with the following benefits: missile effective range can be extended via energy management (fly longer due to reduced drag at lower speed); maximum acceleration levels can be controlled across a range of payload and environmental variables, lessening the requirements on certain types of seekers and guidance units; higher turning rates are achievable at the same missile approach speed (by thrusting on demand at high sideslip angles), thereby enabling more effective intercepts against moving targets; terminal velocity can be controlled on demand; and identical units may be used for training and operational purposes merely by loading less propellant in the training units at the production, with no costly changes to the missile design. A gel propulsion system also results in a deployable missile that is IM-compliant (per MIL-STD-2105B), has improved storage & handling safety and is easily decommissioned/inerted, thereby significantly lowering the overall life-cycle cost of a given missile system. This paper will describe the applications, capabilities, and current state-of-the-art of gelled propulsion systems. A comparative discussion of the most important features of solid, liquid, and gelled propellants will include pertinent technology issues such as toxicity, safety, detonability, packaging, disposal, storability, and materials compatibility. Finally, we will review TRWs experience and demonstrated capabilities in component testing, system testing, and hardware development with gelled propulsion systems and assess the status and readiness of the current generation of hardware for advanced tactical and strategic defense missiles and interceptors.
Author
Gelled Rocket Propellants; Hypergolic Rocket Propellants; Propulsion System Configurations; Propulsion System Performance

20000051559 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
MINIMUM-SIGNATURE PROPELLANT WITH A MIXED-OXIDIZER CONCEPT
Chan, May L., Naval Air Warfare Center, USA; Turner, Alan D., Naval Air Warfare Center, USA; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 41-1 - 41-8; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

Ammonium nitrate (AN) can be an excellent oxidizer because it imparts propellants a desirable low shock sensitivity; however, AN can negatively affect propellant burning characteristics. Work conducted at the Naval Air Warfare Center Weapons Division showed that energetic oxidizers such as cyclotrimethylenetrinitramine (RDX) and triaminoguanidium nitrate (TAGN), when used in conjunction with AN, produce reasonably good combustion behavior. A series of propellants containing AN/RDX or AN/TAGN in an energetic binder were prepared in an attempt to demonstrate their high chemical energy and good combustion properties. The use of ammonium dinitramide (ADN) is relatively recent and, while the potential merits of using ADN in propellants have not been fully assessed, initial results are very encouraging. These results showed that investigators can formulate ADN propellants without the use of burn rate catalysts to achieve good burn rates. High-energy, minimum-signature propellants, incorporating a combination of hexanitrohexaazaisowurtzitane (CL-20) and ADN as the mixed oxidizer, were made with various advanced binder systems. The propellants exhibited good safety and handling properties. In addition, preliminary thermal characterization of these propellants indicated adequate thermal properties and desirable burning behavior.
Author
RDX; Solid Rocket Propellants; Tagn; Signatures

20000051560 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
HIGH PRESSURE BURNING RATE STUDIES OF AMMONIUM PERCHLORATE (AP) BASED PROPELLANTS
Atwood, A. I., Naval Air Warfare Center, USA; Curran, P. O., Naval Air Warfare Center, USA; Price, C. F., Naval Air Warfare Center, USA; Boggs, T. L., Naval Air Warfare Center, USA; Booth, D., Naval Air Warfare Center, USA; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 43-1 - 43-7; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

The move towards increased rocket motor operating pressures has resulted in a need for laboratory measurements of solid rocket propellants burning rates at pressures up to 138 MPa. A technique has been developed combining high pressure window bomb and closed bomb combustion measurements to achieve this requirement. This paper describes a burning rate investigation of AP based solid rocket propellants at pressures between 14 and 140 MPa. The study includes both metalized and nonmetalized

AP based composite propellants. The effect of binder ingredients, catalyst, and oxidizer particle size on propellant burning rate were examined and compared to the burning rate of neat AP.
Author
High Pressure; Burning Rate; Solid Rocket Propellants; Ammonium Perchlorates; Composite Propellants

20000051561 Fraunhofer-Inst. fuer Chemische Technologie, Pfinztal, Germany
Investigations on the Ageing of the Binders GAP-N100 and HTPB-IPDI and on the Extension of Service Time by Kinetic Modelling
Bohn, Manfred A., Fraunhofer-Inst. fuer Chemische Technologie, Germany; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 44-1 - 44-16; In English; See also 20000051537; Copyright Waived; Avail: CASI; A03, Hardcopy

The ageing of the binders GAP-N100 and HTPB-IPDI was investigated by torsion-DMA to find out the changes in the storage shear modulus G'(omega), loss shear modulus G''(omega) and in the glass transition temperature T(sub G). The forced sinusodial deformation method was used with measuring frequencies between 0.1 Hz and 56.2 Hz. A measurement temperature range between -100 C and +50 C was applied. The DMA instrument was a Rheometrics Dynamical Spectrometer, type RDS 11/7700. Non-aged GAP-N100 shows a well defined steep glass transition between -40 C and -25 C, which is found with aged samples also but shifted to higher temperatures. The glass transition of the binder HTPB-IPDI lies between -70 C and -10 C, but HTPB-IPDI has not a well defined glass transition. With ageing it looses its glass transition, which can be seen by a smoothing out of the transition step in the curve G'(omega) = f(T). The behaviour and the differences of these binders are explainable on a molecular basis. The systematic shift of the glass transition temperature of the non-aged and aged GAP-N100 as well as of the non-aged HTPB-IPDI is describable by the Williams- Landel-Ferry equation. This equation was used to extrapolate the values of the glass transition temperature to shear rates possible during the operational use of propellants. The results of ageing investigations on propellants and the already shown possibilities to describe their ageing quantitatively and the therewith obtained improvement in predicting the service times have fostered the now increasing demand for an extension of the service times of propellants. How to achieve this objective in a defined way with propellants will be shown with the example of the kinetic modelling of the consumption of the primary stabilizer and of the concentrations of its consecutive products in a NC-based propellant. The modelling allows to establish the reactivities of the consecutive products relative to the primary stabilizer in the real propellant matrix situation. With the reactivities an effective stabilizer concentration is obtained. The way of an extension of service time by including the reactivity-weighed concentrations of the consecutive products will be shown.
Author
Investigation; Experimentation; Aging (Materials); Mechanical Properties; Propellant Binders; HTPB Propellants

20000051562 Societe Nationale des Poudres et Explosifs, Vert-Le-Petit, France
GRAIN DESIGN FOR TACTICAL ROCKET MOTORS SERVICE LIFE PREDICTION
Stankiewicz, F., Societe Nationale des Poudres et Explosifs, France; Gondouin, B., Societe Nationale des Poudres et Explosifs, France; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 45-1 - 45-7; In French; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

Some failures appear for low temperature firing tests of tactical solid rocket motors. These motors have a high volumetric volume fraction. The analysis of the mechanical behavior of these motors showed a specific scenario to explain the failure. Influent parameters have been determined and a first experimental verification has been performed with a specific test. These influent parameters must be taken into account to determine the service life.
Author
Failure; Low Temperature Tests; Test Firing; Engine Tests; Solid Propellant Rocket Engines

20000051563 Prins Maurits Lab. TNO, Rijswijk, Netherlands
CUMULATIVE DAMAGE OF ROCKET PROPELLANTS
Keizers, H. L. J., Prins Maurits Lab. TNO, Netherlands; Tod, D., Defence Evaluation Research Agency, UK; Small Rocket Motors and Gas Generators for Land, Sea and Air Launched Weapon Systems; April 2000, pp. 46-1 - 46-9; In English; See also 20000051537; Copyright Waived; Avail: CASI; A02, Hardcopy

The lifetime of rocket motors is primarily a function of the mechanical properties of the propellant, the ageing characteristics of the rocket propellant, the grain design and the environmental conditions endured during operational use. Ageing of propellants can be caused by a number of different processes, i.e. chemical, physical and mechanical processes. In a collaborative programme on service lifetime between DERA and TNO, the mechanical ageing characteristics of a typical AP/HTPB propellant are being studied and the results are related to techniques to assess the service lifetime of rocket motors. The applied techniques include

detailed mechanical characterisation of the composite propellant, finite element modelling of the structural behaviour of rocket motors, modelling of the accumulation of mechanical damage and verification tests on instrumented motor analogous. Although specific shortcomings have been identified, the results show that a significant contribution in the assessment of the safe life of rocket motors can be obtained by detailed knowledge of the damage sensitivity of a propellant. This can, if properly included in the development of the rocket motor and the assessment of the structural lifetime, result in significant reductions in overall life cycle costs of missile systems.
Author
Cumulative Damage; Rocket Propellants; Composite Propellants; HTPB Propellants; Mechanical Properties

20000052459 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Chemical Sensing of Unexploded Ordnance with the Mobile Underwater Survey System (MUDSS)
Darrach, M. R., Jet Propulsion Lab., California Inst. of Tech., USA; Chutjian, A., Jet Propulsion Lab., California Inst. of Tech., USA; [1995]; 2p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The ability to sense explosives residues in the marine environment is a critical tool for identification and classification of underwater unexploded ordnance (UXO). Trace explosives signatures of TNT and DNT have been extracted from multiple sediment samples adjacent to unexploded undersea ordnance at Halifax Harbor, Canada. The ordnance was hurled into the harbor during a massive explosion fifty years earlier, in 1945 after World War II had ended. Laboratory sediment extractions were made using the solid-phase microextraction (SPME) method in seawater, and detection using the Reversal Electron Attachment Detection (READ) technique and, in the case of DNT, a commercial gas-chromatography/mass spectrometer (GC/MS). Results show that, after more than 50 years in the environment, ordnance which appeared to be physically intact gave good explosives signatures at the parts-per-billion level, whereas ordnance which had been cracked open during the explosion gave no signatures at the 10 parts-per-trillion sensitivity level. These measurements appear to provide the first reported data of explosives signatures from undersea UXOs.
Author
Explosives; Ordnance; Remote Sensing

29
SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see 84 Law, Political Science and Space Policy.

20000050475 Case Western Reserve Univ., Dept. of Materials Science and Engineering, Cleveland, OH USA
Design of Ceramic Springs for Use in Semiconductor Crystal Growth in Microgravity
Kaforey, M. F., Case Western Reserve Univ., USA; Deeb, C. W., Case Western Reserve Univ., USA; Matthiesen, D. H., Case Western Reserve Univ., USA; [1999]; 14p; In English
Contract(s)/Grant(s): NAG8-1268; NAG8-39722; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Segregation studies can be done in microgravity to reduce buoyancy driven convection and investigate diffusion-controlled growth during the growth of semiconductor crystals. During these experiments, it is necessary to prevent free surface formation in order to avoid surface tension driven convection (Marangoni convection). Semiconductor materials such as gallium arsenide and germanium shrink upon melting, so a spring is necessary to reduce the volume of the growth chamber and prevent the formation of a free surface when the sample melts. A spring used in this application must be able to withstand both the high temperature and the processing atmosphere. During the growth of gallium arsenide crystals during the GTE Labs/USAF/NASA GaAs GAS Program and during the CWRU GaAs programs aboard the First and Second USA microgravity Laboratories, springs made of pyrolytic boron nitride (PBN) leaves were used. The mechanical properties of these PBN springs have been investigated and springs having spring constants ranging from 0.25 N/mm to 25 N/mm were measured. With this improved understanding comes the ability to design springs for more general applications, and guidelines are given for optimizing the design of PBN springs for crystal growth applications.
Author
Ceramics; Crystal Growth; Mechanical Properties; Microgravity; Semiconductors (Materials); Springs (Elastic); Boron Nitrides; Gallium Arsenides

31
ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see categories 32 through 39.

20000047271 Research and Technology Organization, Studies, Analysis and Simulation Panel, Neuilly-sur-Seine, France
The Storage of POL and Chemicals in Packaging in the Royal Netherlands Army
Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 9-1 - 9-14; In English; See also 20000047263; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

In the nineteen eighties a chemical storage facility of Sandoz inc. in Basel suffered a major fire. During this disaster tons of toxic chemicals polluted the river Rhine severely. As a direct result of this disaster, the Netherlands Government introduced new environmental legislation on the storage of Petroleum, Oils, and Lubricants (POL) and chemicals in packaging. This legislation makes a distinction between a facility with a storage capacity of no more than 10 tons of POL and chemicals in packaging (Regulation CPR 15-1) and a facility with a storage capacity of more than 10 tons of POL and chemicals in packaging (Regulation CPR 15-2). If a major accident happens in a CPR 15-2 facility far more than 10 tons of chemicals are involved. As a consequence, requirements for a CPR 15-2 storage facility are much more severe than the requirements for a CPR 15-1 storage facility. Therefore, a CPR 15-2 storage facility is far more expensive. During the Sandoz-fire, all kinds of chemicals reacted in a uncontrolled way with each other. This caused additional risk to the environment. In order to prevent this happening in the future, both CPR 15-1 and CPR 15-2 regulations require the separate storage of chemicals, which can react dangerously with each other. In 1991 the Royal Netherlands Army introduced Environmental Care. As part of this scheme, several storage facilities for POL and chemicals were checked against these new regulations. The findings were: (a) Chemicals which can react dangerously with each other, were not stored in separate compartments, as required by both CPR 15-l and CPR 15-2 regulations; The average soldier had no idea, which chemical has to be separated from which; (b) There was no confidence in the logistics. Besides, every unit within the Army was licensed to order goods from the central Army-depots. As a result, every user within the Army had ample stores of POL and chemicals. At one barracks stores sufficient for one and three quarter years of maintenance were discovered; (c) The storage facilities didn't meet the new requirements as formulated in CPR 15-1 or CPR 15-2; (d) As a consequence of the high level of stock, many Army barracks required a new storage facility accordingly to CPR 15-2; (4) The Commander in chief of the Army ordered an efficient and cost-effective solution for all the above problems.
Derived from text
Environment Protection; Pollution; Regulations; Stockpiling; Military Operations; Netherlands; Hazardous Materials

20000048380 NASA Goddard Space Flight Center, Greenbelt, MD USA
34th Aerospace Mechanisms Symposium
Boesiger, Edward A., Compiler, NASA Goddard Space Flight Center, USA; May 2000; 386p; In English; 34th, 10-12 May 2000, Greenbelt, MD, USA; Sponsored by Lockheed Martin Space Systems Co., USA; See also 20000048381 through 20000048413
Report No.(s): NASA/CP-2000-209895; NAS 1.55:209895; No Copyright; Avail: CASI; A17, Hardcopy; A04, Microfiche

The Aerospace Mechanisms Symposium (AMS) provides a unique forum for those active in the design, production and use of aerospace mechanisms. A major focus is the reporting of problems and solutions associated with the development and flight certification of new mechanisms. The National Aeronautics and Space Administration and Lockheed Martin Space Systems Company (LMSSC) share the responsibility for organizing the AMS. Now in its 34th year, the AMS continues to be well attended, attracting participants from both the U.S. and abroad. The 34th AMS, hosted by the Goddard Space Flight Center (GSFC) in Greenbelt, Maryland, was held May 10, 11 and 12, 2000. During these three days, 34 papers were presented. Topics included deployment mechanisms, bearings, actuators, pointing and optical mechanisms, Space Station mechanisms, release mechanisms, and test equipment. Hardware displays during the vendor fair gave attendees an opportunity to meet with developers of current and future mechanism components.
Derived from text
Conferences; Aerospace Systems; NASA Programs

20000048383 Starsys Research Corp., Boulder, CO USA
Designing Spacecraft Mechanisms for Sand, Dust, Water and Frost
Lankford, Kurt, Starsys Research Corp., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 29-38; In English; See also 20000048380; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

This paper discusses the design trades and lessons learned in the development of a mechanisms package for the Mars Environmental Compatibility Assessment (MECA) Wet Chemistry Laboratory (WCL), an experiment on the Mars 2001 Surveyor Lander.

The WCL performs in-situ wet chemistry experiments on samples of Martian soil. Designing mechanisms to handle Martian soil along with water and frost posed challenges that are somewhat unique and foreign to the spacecraft mechanisms industry. Lessons learned in the development, manufacturing and testing of the various components including the water storage vessel, soil and reagent delivery mechanisms, stirring mechanism, seals, actuators, clearances, and packaging of these mechanisms are discussed.
Author
Spacecraft Design; Structural Design; Mars Surveyor 2001 Mission; Mars Surface; Mars Environment; Structural Analysis

20000048637 Osaka Univ., Faculty of Engineering, Osaka, Japan
Development of Numerically Controlled Plasma Chemical Vaporization Machining System
Mori, Yuzo, Osaka Univ., Japan; Yamamura, Kazuya, Osaka Univ., Japan; Sano, Yasuhisa, Osaka Univ., Japan; Technology Reports of the Osaka University; Apr. 15, 2000; ISSN 0030-6177; Volume 50, No. 2374, pp. 63-69; In English
Contract(s)/Grant(s): MOESSC-08CE2004; Copyright; Avail: Issuing Activity

Conventional machining processes, such as turning, grinding, or lapping are still applied to many materials including functional ones. But those processes are accompanied with deformed layer, so that machined surfaces can not perform original functions. In order to avoid such points, plasma chemical vaporization machining (Plasma CVM) has been developed. In this paper, a newly developed numerically controlled Plasma CVM system for ultra-precision machining is reported.
Author
Atmospheric Pressure; Radicals; Chemical Machining

20000048809 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Development of Thick-Film Thermoelectric Microcoolers Using Electrochemical Deposition
Fleurial, J.-P., Jet Propulsion Lab., California Inst. of Tech., USA; Borshchevsky, A., Jet Propulsion Lab., California Inst. of Tech., USA; Ryan, M. A., Jet Propulsion Lab., California Inst. of Tech., USA; Phillips, W. M., Jet Propulsion Lab., California Inst. of Tech., USA; Snyder, J. G., Jet Propulsion Lab., California Inst. of Tech., USA; Caillat, T., Jet Propulsion Lab., California Inst. of Tech., USA; Kolawa, E. A., Jet Propulsion Lab., California Inst. of Tech., USA; Herman, J. A., Jet Propulsion Lab., California Inst. of Tech., USA; Mueller, P., California Inst. of Tech., USA; Nicolet, M., California Inst. of Tech., USA; [2000]; 8p; In English
Contract(s)/Grant(s): N00014-96-F-0043; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Advanced thermoelectric microdevices integrated into thermal management packages and low power, electrical source systems are of interest for a variety of space and terrestrial applications. by shrinking the size of the thermoelements, or legs, of these devices, it becomes possible to handle much higher heat fluxes, as well as operate at much lower currents and higher voltages that are more compatible with electronic components. The miniaturization of state-of-the-art thermoelectric module technology based on Bi2Te3 alloys is limited due to mechanical and manufacturing constraints for both leg dimensions (100-200 gm thick minimum) and the number of legs (100-200 legs maximum). We are investigating the development of novel microdevices combining high thermal conductivity substrate materials such as diamond, thin film metallization and patterning technology, and electrochemical deposition of thick thermoelectric films. It is anticipated that thermoelectric microcoolers with thousands of thermocouples and capable of pumping more than 200 W/sq cm over a 30 to 60 K temperature difference can be fabricated. In this paper, we report on our progress in developing an electrochemical deposition process for obtaining 10-50 microns thick films of Bi2Te3 and its solid solutions. Results presented here indicate that good quality n-type Bi2Te3, n-type Bi2Te(2.95)Se(0.05) and p-type Bi(0.5)Sb(1.5)Te3 thick films can be deposited by this technique. Some details about the fabrication of the miniature thermoelements are also described.
Author
Fabrication; Thermocouples; Temperature Gradients; Substrates; Solid Solutions; Metallizing; Deposition

20000052478 Technische Univ., Ship Hydromechanics Lab., Delft, Netherlands
Model Experiments on Barge Type Floating Structures Supported by Air Cushions
Tabeta, S.; Jan. 1998; 32p; In English
Report No.(s): PB2000-104673; Copyright; Avail: National Technical Information Service (NTIS)

The main purpose of this study is to validate the numerical method by comparing the numerical results and experimental results. Capture tests in regular waves and forced heave oscillation tests were carried out in order to obtain wave forces and hydrodynamic coefficients of the floating structure supported by air cushions. In both cases, experiments were carried out for the barge type floating structure with one air cushion and two air cushions. Air pressure and water elevation in the air cushion were also

measured in both diffraction and radiation tests. Numerical computations for the same models were carried out to compare with the experimental results.
NTIS
Floating; Gas Pressure

32
COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 Space Communications, Spacecraft Communications, Command and Tracking; for search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation and Safety.

20000046615 Jozef Stefan Inst., Dept. of Digital Communications and Networks, Ljubljana, Slovenia
DECT Based Variable Rate Communication System ***Komunikacijski Sistem s Spremenljivo Bitno Hitrostjo na Podlagi Sistema DECT***
Javornik, Tomaz, Jozef Stefan Inst., Slovenia; Kandus, Gorazd, Jozef Stefan Inst., Slovenia; Loskot, Pavel, Czech Technical Univ., Czechoslovakia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 1, pp. 1-8; In English; Copyright; Avail: Issuing Activity

A DECT-like communication system with a variable rate M-ary continuous phase frequency shift keying (CPFSK) modulation technique is analyzed. The value of the modulation level is adaptively determined in the receiver either by the received signal strength indicator (RSSI) or by eye-closure. The new value of the modulation level is fed back to the modulator through the feedback channel. The transmitted signal is assumed to be affected by white Gaussian noise or by Rayleigh fading, The received signal is noncoherently detected. The system performance was estimated by Monte-Carlo computer simulations. The signals are represented by a complex envelope in the baseband. It was shown that the variable bit rate M-CPFSK gives better results than the constant bit rate CPFSK signal and that the signal eye closure switching approach is superior to the RSSI switching approach.
Author
Modulation; Phase Shift Keying; Telecommunication; Mobile Communication Systems; Pulse Communication

20000048645 University of Electro-Communications, Tokyo, Japan
An Investigation in Qualitative Analysis of Electromagnetic Problems Application to Monopole Antenna (I)
Tayarani, Majid, University of Electro-Communications, Japan; Kami, Yoshio, University of Electro-Communications, Japan; Bulletin of the University of Electro-Communications; December 1999; ISSN 0915-0935; Volume 12, No. 2, pp. 199-126; In English; Copyright; Avail: Issuing Activity

Although the mathematical tools in analysis and modeling of engineering problems are quite accurate and precise and today's technology has been progressed because of this methods, it doesn't mean that mathematical representation of an engineering problem is the simplest one nor the results can be interpreted simply by human understandings. In contrast with mathematical methods, recently some qualitative methods have been considered (e.g. fuzzy as the most common one) those were established basically in order to using human understandings directly. It has been shown that these methods are able to represent an engineering problem surprisingly simply. In this research, the abilities of fuzzy inference methods in modeling of complicated systems are implemented to electromagnetics for the first time. The very popular and well known monopole antenna is chosen as a general example and a fast, simple and accurate fuzzy model for its input impedance is made by introducing a new point of view to impedance basic parameters. It is established that surprisingly little number of input data points are sufficient to make a full model and also the system behavior (dominant rules) are saved as simple membership functions.
Author
Research; Qualitative Analysis; Electromagnetism; Mathematical Models

20000048821 Electronics Research Lab., Salisbury Australia
On the Choice of the Coordinate System and Tracking Filter for the Track-while-scan Mode of an Airborne Pulse Doppler Radar
Zollo, Steven; Ristic, Branko; Dec. 1999; 43p; In English
Report No.(s): AD-A375838; DSTO-TR-0926; DODA-AR-011-191; Copyright; Avail: Defense Technical Information Center (DTIC)

A comparison between tracking in spherical coordinates using coupled range and angle filters and tracking with debased consistent converted measurements in 3D Cartesian coordinates is presented. The sensor is an airborne pulse Doppler radar (APDR)

with typical measurements being range, range-rate, azimuth and elevation. The report investigates the tracking accuracy (position, range-rate and vertical/horizontal heading) achievable in the Medium and High PRF mode of an APDR, for both non-mauoevring and manoeuvring targets. The manoeuvre handling logic is based on the interactive multiple model (IMM) approach.
DTIC
Tracking Filters; Radar Tracking

20000050351 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
RFI-Source Location
Hutchinson, Warren K.; Pelletier, Ronald J.; Siegel, David A.; Mar. 31, 2000; 45p; In English
Contract(s)/Grant(s): F19628-78-C-0002
Report No.(s): AD-A375828; TN-1979-29-REV-1; ESD-TR-79-182; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A method to determine unknown RFI-transmitter site coordinates based on Doppler-shift measurement using the LES-8 or LES-9 satellites and previously existing pieces of ground hardware and software is described. Test cases were run to evaluate the procedure. Several RFI sources have been located. A description is given of the satellites, ground hardware, and software (as they pertain to the location technique), along with results of the site-location experiments. A second method of site location, the terminator-motion technique, is presented. It is based on a satellite rising and setting as seen from the unknown RH-transmitter site. Restrictions on this technique are discussed and results of a test case are presented. This report was originally Classified. It is being reissued with corrections of a few minor errors and misprints.
DTIC
Satellite Communication; Doppler Effect; Computer Programs; Transmitters

20000052255 Massachusetts Inst. of Tech., Lab. of Electronics, Cambridge, MA USA
Fractal Point Process and Queueing Theory and Application to Communication Networks ***Final Report, 1 Jun. 1996-31 Dec. 1999***
Wornel, Gregory W.; Dec. 31, 1999; 11p; In English
Contract(s)/Grant(s): N00014-96-1-0930
Report No.(s): AD-A375382; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A broad program of forward-looking research was pursued within the context of this Young Investigator grant. The emphasis of the research was on the development of high performance, very low complexity techniques for reliable communication over a broad range of realistic wireless and wired networks. A unifying theme in the approaches to these problems has been an integration of interrelated perspectives from communication theory, information theory, signal processing theory, and control theory, together with the infusion of new concepts and ideas from emerging theories of nonlinear dynamics, chaos, and fractal geometry.
DTIC
Fractals; Queueing Theory; Communication Networks

20000052257 Range Commanders Council, Telemetry Group, White Sands Missile Range, NM USA
Telemetry Standards
Jan. 2000; 366p; In English
Report No.(s): AD-A375340; RCC/TG-106-00; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

The Telemetry Group has prepared this document to foster the compatibility of telemetry transmitting, receiving, and signal processing equipment at the Range Commanders Council member ranges. These standards do not necessarily define the existing capability of any test range, but constitute a guide for the orderly implementation and application of telemetry systems for both the ranges and the range user. These standards provide the necessary criteria on which to base equipment design and modification.
DTIC
Telemetry; Signal Processing; Receivers; Transmission

20000052452 NASA Goddard Space Flight Center, Greenbelt, MD USA
On the Treatment of Electric and Magnetic Loss in the Linear Bicharacteristic Scheme for Electromagnetics
Beggs, John H., NASA Goddard Space Flight Center, USA; Mar. 06, 2000; 19p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The upwind leapfrog or Linear Bicharacteristic Scheme (LBS) has previously been extended to treat lossy dielectric and magnetic materials. This paper examines different methodologies for treatment of the electric loss term in the Linear Bicharacteristic Scheme for computational electromagnetics. Several different treatments of the electric loss term using the LBS are explored and

compared on one-dimensional model problems involving reflection from lossy dielectric materials on both uniform and nonuniform grids. Results using these LBS implementations are also compared with the FDTD method for convenience.
Author
Computational Electromagnetics; Finite Difference Time Domain Method; Technology Assessment; Dielectrics; Losses; Method of Characteristics

20000052471 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
The "Myth" of the Minimum SAR Antenna Area Constraint
Freeman, A., Jet Propulsion Lab., California Inst. of Tech., USA; Johnson, W. T. K., Jet Propulsion Lab., California Inst. of Tech., USA; Huneycutt, B., Jet Propulsion Lab., California Inst. of Tech., USA; Jordan, R., Jet Propulsion Lab., California Inst. of Tech., USA; Hensley, S., Jet Propulsion Lab., California Inst. of Tech., USA; Siqueira, P., Jet Propulsion Lab., California Inst. of Tech., USA; Curlander, J., Vexcel Corp., USA; [1998]; 3p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
A design constraint traceable ot the early days of spaceborne Synthetic Aperture Radar (SAR) is known as the minimum antenna area constraint for SAR. In this paper, it is confirmed that this constraint strictly applies only to the case where both the best possible resolution and the widest possible swath are the design goals. SAR antennas with area smaller than the constraint allows are shown to be possible, have been used on spaceborne SAR missions in the past, and should permit further, lower-cost SAR mission in the future.
Author
Synthetic Aperture Radar; Antenna Design; Constraints

20000052515 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Airborne Paging Demonstration
Niessen, Charles W.; Mar. 25, 2000; 24p; In English
Contract(s)/Grant(s): F19628-95-C-0002
Report No.(s): AD-A375196; TR-1057; ESC-TR-99-046; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Personal pagers have found wide-spread use in the commercial world, allowing people on the road or away from their office to be contacted with a simple message, often to "call home." The utility of this service clearly translates to the battlefield. However, the tactical battlefield does not come equipped with the large infrastructure that is used by the commercial systems. For the battlefield, either a satellite-born or an airborne transmitter can be used to activate near-commercial paging receivers. During an earlier program, paging from military communications satellites at UHF was demonstrated. However, the available signal margin was too low for reliable paging, particularly into structures.
DTIC
Airborne Equipment; Transmitters; Receivers

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also 60 Computer Operations and Hardware; and 76 Solid-State Physics. For communications equipment and devices see 32 Communications and Radar.

20000045717 Office of Naval Research, Arlington, VA USA
Method and Design for the Suppression of Single Event Upset Failures in Digital Circuits Made From GaAs and Related Compounds
Dietrich, Harry B., Inventor; Dec. 09, 1999; 13p; In English
Patent Info.: Filed 9 Dec. 1999; US-Patent-Appl-SN-09,457,521
Report No.(s): AD-D019619; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche
Like all electronic devices, digital circuits execute the functions for which they are designed, through the careful control of charge flow within the circuit. The introduction of stray charge through leakage, temperature excursions or ionizing radiation can cause any electronic circuit to malfunction. Digital circuits, because of the low voltages and currents inherent in the devices from which they are constructed, are extremely susceptible to stray charge. The present invention relates generally to digital circuits and more specifically to digital circuits made from GaAs and related compounds.
DTIC
Circuit Boards; Electronic Packaging; Electronic Equipment; Digital Electronics; Logic Circuits; Single Event Upsets

20000046601 Department of the Navy, Washington, DC USA

Amplification by Means of Dysprosium Doped Low Phonon Energy Glass Waveguides

Sanghera, Jasbinder, Inventor; Shaw, Brandon, Inventor; Cole, Brian, Inventor; Harbison, Barry, Inventor; Aggarwal, Ishwar D., Inventor; Oct. 26, 1999; 10p; In English; Supersedes US-Patent-Appl-SN-08920877, AD-D018634.

Patent Info.: Filed 29 Aug. 1997; US-Patent-Appl-SN-08,920,877; US-Patent-5,973,824

Report No.(s): AD-D019654; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Disclosed herein is an amplification method, an optical glass amplifier, a laser based on the amplifier and an amplification optical communication system, all based on a limited length of a single-mode glass fiber made from glass having phonon energy of less than about 350/cm and doped with dysprosium. The glass includes 0.1-30 mol % germanium, 0-40 mol % arsenic, 0.02-20 mol % X. 0.01-20 mol % Y, and 0.001-2 weight % dysprosium, wherein X is selected from the group consisting of gallium, indium and mixtures thereof selenium; and wherein Y is selected from the group consisting of selenium, and mixtures of selenium and up to 50% of sulfur. The system includes a coupler, a silica-based signal fiber carrying the optical signal that is to be amplified in communication with said coupling means, a pump light source in communication with the coupler, an amplifier in communication with the coupler at one end and another silica-based fiber joined to the amplifier at its other end. The method includes the steps of introducing the optical signal to be amplified into the coupler, introducing a pump optical signal into the coupling means, combining the optical signal and the pump optical signal, introducing the combined optical signal into the amplifier and amplifying the optical signal by exciting the electrons in dysprosium no they emit at about 1.3 micrometers.

DTIC

Light Amplifiers; Optical Waveguides; Waveguide Lasers; Optical Communication; Optical Materials

20000046609 Ljubljana Univ., Fakulteta za Elektrotehniko, Ljubljana, Slovenia

Location of Faults on Electrical Lines Using Pulse Reflectogram ***Dolocanje Mesta Okvar na Elektricnih Kablih s Pulznim Odzivom***

Agrez, Dusan, Ljubljana Univ., Slovenia; Gabrovsek, Peter, Metrel, Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 1, pp. 16-22; In Slovak; Copyright; Avail: Issuing Activity

In development of an algorithm for the pulse propagation time to the fault on cable and back to the entry two major problems must be solved: estimation of the representative points of the reflected pulse with low sensitivity to noise and elimination of the additional measurement delay caused by the skin effect. The procedure with the quadratic regression function for estimation of the reflected pulse beginning is presented. The operator or the algorithm in the fault measurement instrumentation searches for the transition points of the pulse, i.e., the locations where the signal seems to ”start”. In the frequency domain (G(f) = Fr(g(t)); F Fourier transform), the response to a certain stimulus applied to the electrical line is well approximated by the equation (1). The exponential expression in the equation can be written in three parts: e (exp -2 gamma l (sub x)) = e (exp -2 gamma A l (sub x)) raised dot e (exp -2 gamma B l (sub x)) raised dot e (exp -2 gamma l (sub x) (exp l sub x)). The first one is determinated by material and geometrical attenuation of the electrical line and the second part is the attenuation caused by the frequency dependence of the line parameters. The constant T = (BL (sub x)/2Z (sub k) squared represents the measure of the skin effect deformation. B is a material-geometrical constant with dimension [R][t] (exp 1/2)/[l] = OMEGA S (exp 1/2)/m. The skin effect adds the deformation of the reflected pulse that includes the delay in the form that someone gets with the transformation of the second part back in the time domain. In the time of the pulse propagation some delay must be considered because changes of the signal at the pulse beginning caused by the skin effect are not perceived in measurement practice. With a view of estimating the reflected pulse beginning that would not be dependent on width and amplitude of the pulse stimulus an analysis of the pulse rising shape was made with a moving window of the width DELTA t (sub 0) along the rising part of, the reflected pulse for time t (sub p). The best fit we get with the quadratic regression function. The coefficient c (sub 1) falls monotonous with moving the window down the pulse shape and at ”the beginning” of the pulse changes its sign. The point where c (sub 1) takes value 0 was marked with t (sub vz). The regression function has at this point only the constant and the quadratic part and the symmetrical axis of the quadratic parabola x = -c (sub 1)/(2C (sub 2)) lies at the beginning of the window (c (sub 1) = 0 right arrow x = 0). The benefits of the proposed procedure are: independence of the width and the amplitude of the pulse stimulus, because the criterion of the beginning position is the shape of the regression function (the symmetrical axis of the parabola lies at the left edge of the regression window); in estimation of the pulse beginning are used only points of the raising part of the pulse that is mainly determined by the analyzed fault and in usage of the regression coefficients that reduce the sensitivity on noise (proportional to 1/square root of n (sub 0), n (sub 0) - number of sampling points in window DELTA t (sub 0). The weak part of the procedure is in partial dependence of the beginning point t (sub vz) on the window width DELTA t (sub 0). It has to be assured that the window width is relative to the width of the rising part of the reflected pulse.

Author

Fault Detection; Algorithms; Transmission Lines; Electric Pulses; Reflectometers

20000046614 Milan Vidmar Electric Power Research Inst., Ljubljana, Slovenia

Consideration of Metal-Oxide Lightning Arresters Installed on Overhead Transmission Lines ***Obravnava Kovinsko-Oksidnega Prenapetostnega Odvodnika na Nadzemnem Vodu***

Babuder, Maks, Milan Vidmar Electric Power Research Inst., Slovenia; Electrotechnical Review; 20000; ISSN 0013-5852; Volume 67, No. 1, pp. 30-34; In English; Copyright; Avail: Issuing Activity

The paper deals with some important aspects to be considered while installing metal-oxide arresters (MOA) on high voltage overhead transmission lines. It gives an insight into the Slovene experiences gained in the past decade and assesses the expected long term behaviour of metal-oxide resistor blocks. The first station type MOA in the Slovene electric power system and particularly their behaviour on overhead lines are described, too.

Author

Metal Oxides; Transmission Lines; Arresters; Lightning; Resistors

20000048262 NASA Pasadena Office, CA USA

Thermally Regenerative Battery with Intercalatable Electrodes and Selective Heating Means

Sharma, Pramod K., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Narayanan, Sekharipuram R., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Hickey, Gregory S., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Mar. 28, 2000; 8p; In English

Patent Info.: Filed 20 Feb. 1998; NASA-Case-NPO-19824; US-Patent-6,042,964; US-Patent-Appl-SN-035408; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The battery contains at least one electrode such as graphite that intercalates a first species from the electrolyte disposed in a first compartment such as bromine to form a thermally decomposable complex during discharge. The other electrode can also be graphite which supplies another species such as lithium to the electrolyte in a second electrode compartment. The thermally decomposable complex is stable at room temperature but decomposes at elevated temperatures such as 50 C. to 150 C. The electrode compartments are separated by a selective ion permeable membrane that is impermeable to the first species. Charging is effected by selectively heating the first electrode.

Official Gazette of the U.S. Patent and Trademark Office

Electric Batteries; Regeneration (Engineering); Thermal Batteries; Lithium; Electrodes

20000048278 California Univ., Davis, CA USA

(DURIP 99) Mig Electron Gun for Megawatt Ka-Band Gyrotron Amplifiers ***Final Report, 1 Mar. 1999 - 28 Feb. 2000***

McDermott, David; Feb. 2000; 6p; In English

Contract(s)/Grant(s): F49620-99-1-0145; AF Proj. 3484

Report No.(s): AD-A375980; AFRL-SR-BL-TR-00-0094; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

The equipment purchased with the 1999 DURIP contract F49620-99-1-0145 is listed below. Cost of Equipment and Vendor: W-band electron gun and ultra-high-vacuum chamber $149,950.68 Stanford Linear Accelerator Center The W-band electron gun and vacuum system is to be used in evaluation of beam focusing and beam transport issues that arise during the development of high average power millimeter wave sources.

DTIC

Electron Guns; Cyclotron Resonance Devices

20000048392 Energen, Inc., Billerica, MA USA

Application of Magnetic Smart Materials to Aerospace Motion Control

Joshi, Chad H., Energen, Inc., USA; Bent, Bruce R., Energen, Inc., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 137-142; In English; See also 20000048380; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Energen, Inc. has developed linear actuators and linear stepper motors based on magnetostrictive materials. These devices are designed to operate efficiently in harsh vacuum and cryogenic environments. They provide submicron positioning resolution over a range of motion of 20 mm or more. The linear actuators have high bandwidth and a short stroke making them ideal for active vibration damping high speed optical positioning. The stepper motors have a long stroke and will hold position when powered off.

Author

Linearity; Actuators; Active Control; Stepping Motors; Magnetic Materials; Smart Materials; Vibration Damping

20000048396 Schaeffer Magnetics, Inc., Chatsworth, CA USA

Miniature Linear Actuator

Asadurian, Armond, Schaeffer Magnetics, Inc., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 163-166; In English; See also 20000048380; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The objective was to design and develop a linear actuator for two different applications using one basic design philosophy. The basic design configuration was based on an incremental rotary actuator, which was derived from the family of standard SMD actuators. Linear motion was obtained from a precision ballscrew attached to the rotary output member of the actuator. This arrangement produced a linear output motion at the mating ball-nut. In one application, the actuator was used to precisely position two sliding loads within a RF Variable Power Divider. The other application required the linear actuator to rotate a reflector around a gimbal pivot point within an Antenna Pointing Mechanism.

Author

Miniaturization; Actuators; Linearity; Performance Tests

20000048398 ETEL Aerospace, Inc., Boulder, CO USA

Motor Redundancy Concepts: Efficient or Reliable?

Favre, Eric, ETEL Aerospace, Inc., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 175-188; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

When a redundant electric motor is required to activate a mechanism, a trade-off is made in order to determine which type of redundancy to implement. This paper presents the five different design options available for the motor redundancy, with an emphasis on their respective and relative performances and comparing both their advantages and disadvantages. The impact of considering a redundant motor at sub-system level (mechanism) is also addressed.

Author

Design Analysis; Stepping Motors; Redundancy; Efficiency

20000048407 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

The SeaWinds Scatterometer Antenna Subsystem on the QuikScat Spacecraft

Workman, Brian J., Honeywell, Inc., USA; Schwartzbaum, Eric, Jet Propulsion Lab., California Inst. of Tech., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 275-286; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

In today's environment of "Better, Faster, Cheaper", the ability to produce reliable, flight-proven mechanisms for mission critical applications is more important than ever. Such a mechanism was produced for the QuikScat satellite. The Scatterometer Antenna Subsystem (SAS) is a spin mechanism that continuously rotates a scatterometer antenna, and includes the necessary features (rotary interfaces, drives, launch locks, etc) to allow collection of the scatterometry data that will insure mission success. This paper will discuss the evolution of the SAS from its design heritage on the GGS Polar mission to qualification on the ADEOS II satellite to being a key enabler for the rapid development of the QuikScat Satellite.

Author

Scatterometers; Wave Scattering; Antenna Design; Actuators

20000048483 Delaware Univ., Dept. of Electrical and Computer Engineering, Newark, DE USA

Modulated Coding for Digital Communication Systems Under ISI/Multipath Fading and Jamming ***Final Report, i Jan. 1998-30 Nov. 1999***

Xia, Xiang-Gen; Mar. 14, 2000; 9p; In English

Contract(s)/Grant(s): F49620-98-1-0352

Report No.(s): AD-A375853; AFRL-SR-BL-TR-00-0086; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This report describes the main research achievements during the time period cited above on the research project in the area of telecommunications. The main achievements include the systematic study of modulated codes that are convolutional codes defined on real/complex field over intersymbol interference, multipath, jamming channels. We obtained the joint maximum-likelihood decoding, and the MMSE-DFE decoding algorithms. We proved the existence of the coding gain compared to the uncoded AWGN channel. We also obtained space-time modulated codes for multiple transmit and multiple receive antenna systems. A new precoded OFDM system was also obtained which is robust to spectral-nulls.

DTIC

Jamming; Multipath Transmission; Coding; Research; Telecommunication; Pulse Communication

20000048614 California Univ., Electrical Engineering Dept., Los Angeles, CA USA

Multi-Element GPS Antenna Array on an RF Bandgap Ground Plane ***Final Report, 1 Nov. 1998-1 Nov. 1999***

Yablonovitch, Eli; Mar. 15, 2000; 7p; In English

Contract(s)/Grant(s): N00014-99-1-0136

Report No.(s): AD-A375854; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Antenna arrays on conventional ground planes present different deficiencies. For compact platforms, the propagation of RF surface currents results in lost power, radiation from the edges and other discontinuities. It also contributes to the strong coupling and causes blind angles and multipath interference. by building radio isolation into the ground plane of phased array antenna structures, it is possible to reduce these different disturbances. This isolation may be achieved by using corrugated surfaces. In this case, DC currents are conducted but not AC currents. Based on the previous work done on PBG structure, a new kind of surface called High Impedance Ground Plane can be used. This kind of ground plane presents the same characteristics are corrugated surfaces in all the directions. Moreover the thickness must no longer be one fourth of the wavelength and can be even much smaller. These ground planes have been applied antenna array in order to reduce the disturbances created on compact platforms. Phase measurements of two-dipole array clearly shows this reduction.

DTIC

Global Positioning System; Antenna Arrays; Radio Frequencies; Ground State

20000048818 Raytheon Systems Co., Dallas, TX USA

Silicon-Based Quantum MOS Technology Development ***Final Report, 13 Dec. 1995 - 31 Dec. 1999***

Seabaugh, Alan, Raytheon Systems Co., USA; Kirk, Wiley, Texas A&M Univ., USA; Kolodzey, James, Delaware Univ., USA; Lyding, Joseph, Illinois Univ., USA; Mazumder, Pinaki, Michigan Univ., USA; Frensley, William, Texas Univ., USA; Mar. 07, 2000; 285p; In English

Contract(s)/Grant(s): F49620-96-C-0006

Report No.(s): AD-A375774; AFRL-SR-BL-TR-00-0091; No Copyright; Avail: CASI; A03, Microfiche; A13, Hardcopy

This program demonstrated the first compatible resonant tunneling diodes (RTD) for integration with CMOS (complementary metal oxide semiconductor) technology and designed circuits to exploit and evaluate the speed-power advantage of integrated RTD and CMOS devices. The first Si-based resonant interband tunnel diodes were demonstrated with peak current density greater than 10(exp 4) A/sq cm; peak-to-valley current ratio exceeding 2 was achieved at room temperature. The SiO2/Si/SiO2 RTD was studied extensively in a variety of forms, however no room temperature negative differential resistance was observed in the SiO2/Si/SiO2 system. Other double barrier systems were also studied including ZnS/Si, CaF2/Si, and Si3N4/Si without evidence of resonant tunneling. Circuit designs using SPICE showed that integration of tunnel diodes with CMOS provides typically more than 2x speed and density improvement for analog and digital circuits and more than 20x reduction in static power dissipation for memory over conventional circuit approaches. A roadmap was developed outlining the steps to commercialization.

DTIC

Integrated Circuits; CMOS; Silicon Dioxide; Silicon Nitrides; Design Analysis; Commercialization

20000050221 Anvik Corp., Hawthorne, NY USA

oll-to-Roll, Projection Lithography System for High-Resolution Patterning of Flexible Substrates, Volume 1 ***Final Report, Jan 1996 - May 1999***

Jain, K., Anvik Corp., USA; Dunn, T. J., Anvik Corp., USA; Farmiga, N., Anvik Corp., USA; Zemel, M., Anvik Corp., USA; May 1999; 22p; In English

Contract(s)/Grant(s): F33615-96-C-1802; AF Proj. ARPE

Report No.(s): AD-A375710; AFRL-SN-WP-TR-1999-1067-V-1; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This Final Report describes the ANVIK 3100 SRE roll-to-roll lithography system which was shipped to Sheldahl, Inc. (Longmont, CO) in May 1998. The machine is currently being phased into Sheldahl's production facilities where it will be used for microelectronic fabrication on flexible substrates. In the Report, a general overview of the system is presented

DT

*Lithography; Excimers; Fabrication; Microelectronics*IC

20000050270 Department of the Navy, Washington, DC USA

SAGNAC Interferometer Amplitude Modulator Based Demultiplexer

Dennis, Michael L., Inventor; Duling, Irl N., III, Inventor; Burns, William K., Inventor; Dec. 07, 1999; 19p; In English; Supersedes US-Patent-Appl-SN-09/026819

Patent Info.: Filed 20 Feb. 1998; US-Patent-5,999,292; US-Patent-Appl-SN-09/026,819

Report No.(s): AD-D019641; No Copyright; Avail: US Patent and Trademark Office, Microfiche

This invention is a demultiplexer consisting on a sequential division of the data stream in a series of Sagnac interferometer amplitude modulators (SIAMs), wherein each modulator in the series is driven by a single microwave frequency derived directly from a radio frequency (RF) data rate clock, with the RF phase properly adjusted to extract a channel of interest.

DTIC

Interferometers; Amplitude Modulation; Demultiplexing; Time Division Multiplexing

20000050272 Department of the Navy, Washington, DC USA

Electrochemical Fabrication of Capacitors

Mansour, Azzam N., Inventor; Melendres, Carlos A., Inventor; Dec. 14, 1999; 5p; In English; Supersedes US-Patent-Appl-SN-08982892, AD-D019449.

Patent Info.: Filed 2 Dec. 1997; US-Patent-Appl-SN-08,982,892; US-Patent-6,001,237

Report No.(s): AD-D019639; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A film of nickel oxide is anodically deposited on a graphite sheet held in position on an electrochemical cell during application of a positive electrode voltage to the graphite sheet while exposed to an electrolytic nickel oxide solution within a volumetrically variable chamber of the cell. An angularly orientated x-ray beam is admitted into the cell for transmission through the deposited nickel oxide film in order to obtain structural information while the film is subject to electrochemical and in-situ x-ray spectroscopy from which optimum film thickness, may be determined by comparative analysis for capacitor fabrication purposes.

DTIC

Fabrication; Electrochemistry; Anodic Stripping; Graphite; Capacitors; Patents

20000050467 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Displacement Damage in Bipolar Linear Integrated Circuits

Rax, B. G., Jet Propulsion Lab., California Inst. of Tech., USA; Johnston, A. H., Jet Propulsion Lab., California Inst. of Tech., USA; Miyahira, T., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 4p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Although many different processes can be used to manufacture linear integrated circuits, the process that is used for most circuits is optimized for high voltage -- a total power supply voltage of about 40 V -- and low cost. This process, which has changed little during the last twenty years, uses lateral and substrate p-n-p transistors. These p-n-p transistors have very wide base regions, increasing their sensitivity to displacement damage from electrons and protons. Although displacement damage effects can be easily treated for individual transistors, the net effect on linear circuits can be far more complex because circuit operation often depends on the interaction of several internal transistors. Note also that some circuits are made with more advanced processes with much narrower base widths. Devices fabricated with these newer processes are not expected to be significantly affected by displacement damage for proton fluences below 1 x 10(exp 12) p/sq cm. This paper discusses displacement damage in linear integrated circuits with more complex failure modes than those exhibited by simpler devices, such as the LM111 comparator, where the dominant response mode is gain degradation of the input transistor. Some circuits fail catastrophically at much lower equivalent total dose levels compared to tests with gamma rays. The device works satisfactorily up to nearly 1 Mrad(Si) when it is irradiated with gamma rays, but fails catastrophically between 50 and 70 krad(Si) when it is irradiated with protons.

Author

Displacement; Damage; Bipolarity; Linear Integrated Circuits; Failure Modes

20000051493 Alabama Univ., Systems Management and Production Lab., Huntsville, AL USA

Microelectronic Spare and Repair Part Status Analysis of the PATRIOT System ***Final Report, 17 Apr. 1996 - 16 Apr. 1997***

Maddux, Gary A., Alabama Univ., USA; Jul. 1999; 8p; In English

Contract(s)/Grant(s): DAAH01-92-D-R006

Report No.(s): AD-A375714; UAH-TR-5-34432; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

AMCOM Industrial Operations Division (IOD) required engineering support in performing microelectronic technology and availability assessments for several hundred items and in assessing the impact of nonavailability on the PATRIOT weapon system. IOD also required engineering support in performing producibility analyses of me PATRIOT weapon system. In order to facilitate

the assessment of this system. me Systems Management and Production Laboratory at The University of Alabama in Huntsville Research Institute was tasked to conduct an in-depth analysis as to the life cycle health of the PATRIOT weapon system's component parts.
DTIC
Microelectronics; Surface to Air Missiles; Maintenance; Support Systems

20000051536 Michigan Univ., Ultrafast Science Lab., Ann Arbor, MI USA
Carrier Dynamics and Defects in GaAs and Related Photoconductors ***Final Report, 15 Mar. 1995-31 Aug. 1998***
Norris, Theodore B.; Whitaker, John F.; Mar. 15, 2000; 49p; In English
Contract(s)/Grant(s): F49620-95-1-0227
Report No.(s): AD-A375403; AFRL-SR-BL-TR-00-0080; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Our program on Carrier Dynamics and Defects in GaAs and Related Photoconductors concentrated on two major thrusts: the study of the physical processes involved in trapping and recombination of carriers in low-temperature-MBE-grown (LT) GaAs, and the development of high-speed photoconductive probes. by using femtosecond time-resolved optical spectroscopy, with both above-gap and below-gap excitation and probing, we were for the first time able to measure the separate trapping times for electrons and holes, determine the lifetimes of the carriers within the traps, observe trap saturation, and observe an unusually large Auger recombination rate caused by the high density of crystal defects in LT-GaAs. The affects of surface passivation, materials growth conditions (temperature, annealing, and implantation) were studied. Two kinds of photoconductive devices were developed. A freely positionable voltage probe with picosecond time response, unprecedented sensitivity (30 nanovolts per root hertz), and high (micron) spatial resolution was developed. The same technology was adapted to develop a novel miniature source for terahertz radiation. The photoconductive probe was applied to the study of millimeter-wave devices and circuits.
DTIC
Crystal Defects; Gallium Arsenides; Molecular Beam Epitaxy; Photoconductivity; Photoconductors

20000052243 Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
Plasmon-phonon pairing mechanism and superconducting state parameters in layered mercury cuprates
Varshney, D.; Tosi, M. P.; Jun. 30, 1999; 21p; In English
Report No.(s): DE99-627830; IC-99/67; No Copyright; Avail: Department of Energy Information Bridge
An effective two-dimensional dynamic interaction is developed which incorporated screening of holes by plasmons and by optical phonons to discuss the nature of the pairing mechanism leading to superconductivity in layered mercury cuprates. The system is treated as an ionic solid containing layers of charge carriers and a model dielectric function is set up which fulfils the appropriate sum rules on the electronic and ionic polarizabilities. The values of the coupling strength and of the Coulomb interaction parameter indicate that the superconductor is in the strong coupling regime with effective screening of the charge carriers. The superconducting transition temperature of optically doped HgBa2CuO(sub 4+(delta)) is estimated as 94 K from Kresin's strong coupling theory and the energy gap ratio is substantially larger than the BCS value. The value of the isotope exponent is severely reduced below the BCS value. The implications of the model and its analysis are discussed.
NTIS
Plasmons; Phonons; Superconductivity

20000052449 Metallurgical Society, Warrendale, PA USA
Workshop on Doping, Dopants and Low Field Carrier Dynamics in Wide Gap Semiconductors. Meeting Program and Abstract Book, ***1 Jul. 1999 - 30 Jun. 2000***
Schubert, Fred; Mar. 06, 2000; 53p; In English, 2-6 Apr. 2000, Copper Mountain, CO, USA
Contract(s)/Grant(s): N00014-99-1-0766
Report No.(s): AD-A375866; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy
Meeting program, including abstracts, for the doping, dopants and carrie dynamics in wide gap semiconductors workshop is discussed.
Author (DTIC)
Conferences; Additives

34
FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also 02 Aerodynamics.

20000045686 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
A Reduced Order Model of the Linearized Incompressible Navier-Strokes Equations for the Sensor/Actuator Placement Problem *Final Report*
Allan, Brian G., Institute for Computer Applications in Science and Engineering, USA; April 2000; 30p; In English; 3rd Joint Fluids Engineering Conference, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2000-210110; NAS 1.26:210110; ICASE-2000-19; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A reduced order modeling approach of the Navier-Stokes equations is presented for the design of a distributed optimal feedback kernel. This approach is based oil a Krylov subspace method where significant modes of the flow are captured in the model This model is then used in all optimal feedback control design where sensing and actuation is performed oil tile entire flow field. This control design approach yields all optimal feedback kernel which provides insight into the placement of sensors and actuators in the flow field. As all evaluation of this approach, a two-dimensional shear layer and driven cavity flow are investigated.
Author
Mathematical Models; Navier-Stokes Equation; Kernel Functions; Shear Layers; Flow Distribution

20000045688 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Improving Jet Reactor Configuration for Production of Carbon Nanotubes
Povitsky, Alex, Institute for Computer Applications in Science and Engineering, USA; April 2000; 26p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2000-210108; NAS 1.26:210108; ICASE-2000-18; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The jet mixing reactor has been proposed for the industrial production of fullerene carbon nanotubes. Here we study the flow-field of this reactor using the SIMPLER algorithm. Hot peripheral jets are used to enhance heating of the central jet by mixing with the ambiance of reactor. Numerous configurations of peripheral jets with various number of jets, distance between nozzles, angles between the central jet and a peripheral jets, and twisted configuration of nozzles are considered. Unlike the previous studies of jet mixing, the optimal configuration of peripheral jets produces strong non-uniformity of the central jet in a cross-section. The geometrical shape of reactor is designed to obtain a uniform temperature of a catalyst.
Author
Jet Mixing Flow; Research; Flow Distribution; Reactor Design

20000045990 McDonnell-Douglas Corp., Long Beach, CA USA
Full Configuration Force and Moment Calculations Using Multiblock CFL3D on HSCT Configurations
Martin, Grant L., McDonnell-Douglas Corp., USA; Narducci, Robert P., McDonnell-Douglas Corp., USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 44-112; In English; See also 20000045988; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A10, Microfiche

During the past year, the McDonnell Douglas Corporation (MDC) has made large strides in Computational Fluid Dynamics (CFD) analysis of increasingly complex HSCT configurations using both serial and parallel computational platforms. While tools for grid generation and analysis on serial computers have remained relatively unchanged, a new gridding strategy has been employed to obtain Navier-Stokes analyses of HSCT configurations which include the wing, body, nacelles, diverters, and empennage. Additionally, with the promising efficiency of parallel machines, MDC has contributed to the development of CFL3Dhp, a parallel version of CFL3D for the IBM SP-2. Presented herein are full configuration Euler and Navier-Stokes solutions obtained using CFL3D on the NAS C-90 and IBM SP-2. With the objectives of validating CFL3D for supersonic cruise calculatio s on several platforms, CFD results for the Reference H and Technology Concept Airplane (TCA) configurations are presented in a build-up fashion. The build-up fashion entails analyzing the simplest of configuration first, the wing/body (W/B) followed by the additional complexity of the empennage (W/B/E), then nacelles and diverters (W/B/N/D), and finally the entire configuration (W/B/N/D/E). A thorough build-up has been performed on the Reference H configuration, while the TCA build-up work is still

in progress. To assist in the validation, a number of comparisons are made to available experimental data from the NASA Langley Unitary Plan Wind Tunnel (UPWT).
Author
Civil Aviation; Multiblock Grids; Supersonic Transports; Wind Tunnel Tests; Body-Wing and Tail Configurations; Computational Fluid Dynamics; Pitching Moments

20000045997 NASA Langley Research Center, Hampton, VA USA
Forced Transition Techniques on HSCT Configurations
Wahls, Richard A., NASA Langley Research Center, USA; Bauer, Steven X. S., NASA Langley Research Center, USA; Owens, Lewis R., Jr., NASA Langley Research Center, USA; 1997 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 1, Part 1, pp. 477-508; In English; See also 20000045988; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The objectives of this effort were to determine (if possible) the best method: 1) for forcing the boundary layer to transition, 2) for assessing trip effectiveness, 3) for quantifying trip drag, 4) for testing at Reynolds numbers per foot from 5 million to maximum available rather than I to 5 million, and 5) for boundary layer state determination.
Derived from text
Boundary Layer Transition; Supersonic Transports; Aerodynamic Configurations; Civil Aviation; Loads (Forces)

20000046606 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Theory of the lattice Boltzmann Method: Dispersion, Dissipation, Isotropy, Galilean Invariance, and Stability *Final Report*
Lallemand, Pierre, Paris XI Univ., France; Luo, Li-Shi, Institute for Computer Applications in Science and Engineering, USA; April 2000; 33p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2000-210103; NAS 1.26:210103; ICASE-2000-17; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The generalized hydrodynamics (the wave vector dependence of the transport coefficients) of a generalized lattice Boltzmann equation (LBE) is studied in detail. The generalized lattice Boltzmann equation is constructed in moment space rather than in discrete velocity space. The generalized hydrodynamics of the model is obtained by solving the dispersion equation of the linearized LBE either analytically by using perturbation technique or numerically. The proposed LBE model has a maximum number of adjustable parameters for the given set of discrete velocities. Generalized hydrodynamics characterizes dispersion, dissipation (hyper-viscosities), anisotropy, and lack of Galilean invariance of the model, and can be applied to select the values of the adjustable parameters which optimize the properties of the model. The proposed generalized hydrodynamic analysis also provides some insights into stability and proper initial conditions for LBE simulations. The stability properties of some 2D LBE models are analyzed and compared with each other in the parameter space of the mean streaming velocity and the viscous relaxation time. The procedure described in this work can be applied to analyze other LBE models. As examples, LBE models with various interpolation schemes are analyzed. Numerical results on shear flow with an initially discontinuous velocity profile (shock) with or without a constant streaming velocity are shown to demonstrate the dispersion effects in the LBE model; the results compare favorably with our theoretical analysis. We also show that whereas linear analysis of the LBE evolution operator is equivalent to Chapman-Enskog analysis in the long wave-length limit (wave vector k = 0), it can also provide results for large values of k. Such results are important for the stability and other hydrodynamic properties of the LBE method and cannot be obtained through Chapman-Enskog analysis.
Author
Boltzmann Transport Equation; Dispersion; Dissipation; Isotropism; Invariance; Stability; Hydrodynamics; Velocity Distribution; Two Dimensional Models

20000046785 Weizmann Inst. of Science, Rehovot, Israel
Advanced Multigrid Solvers for Fluid Dynamics
Brandt, Achi, Weizmann Inst. of Science, Israel; [1999]; 7p; In English
Contract(s)/Grant(s): NAG1-1823; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The main objective of this project has been to support the development of multigrid techniques in computational fluid dynamics that can achieve ”textbook multigrid efficiency” (TME), which is several orders of magnitude faster than current industrial CFD solvers. Toward that goal we have assembled a detailed table which lists every foreseen kind of computational difficulty for achieving it, together with the possible ways for resolving the difficulty, their current state of development, and references. We

have developed several codes to test and demonstrate, in the framework of simple model problems, several approaches for overcoming the most important of the listed difficulties that had not been resolved before. In particular, TME has been demonstrated for incompressible flows on one hand, and for near-sonic flows on the other hand. General approaches were advanced for the relaxation of stagnation points and boundary conditions under various situations. Also, new algebraic multigrid techniques were formed for treating unstructured grid formulations. More details on all these are given below.
Derived from text
Computational Fluid Dynamics; Multigrid Methods; Algorithms; Algebra

20000046789 NASA Lewis Research Center, Cleveland, OH USA
Manipulation of Liquids Using Phased Array Generation of Acoustic Radiation Pressure
Oeftering, Richard C., Inventor, NASA Lewis Research Center, USA; Feb. 29, 2000; 32p; In English
Patent Info.: Filed 17 Sep. 1997; NASA-Case-LEW-16470-1; US-Patent-6,029,518; US-Patent-Appl-SN-969537; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A phased array of piezoelectric transducers is used to control and manipulate contained as well as uncontained fluids in space and earth applications. The transducers in the phased array are individually activated while being commonly controlled to produce acoustic radiation pressure and acoustic streaming. The phased array is activated to produce a single pulse, a pulse burst or a continuous pulse to agitate, segregate or manipulate liquids and gases. The phased array generated acoustic radiation pressure is also useful in manipulating a drop, a bubble or other object immersed in a liquid. The transducers can be arranged in any number of layouts including linear single or multi- dimensional, space curved and annular arrays. The individual transducers in the array are activated by a controller, preferably driven by a computer.
Official Gazette of the U.S. Patent and Trademark Office
Radiation Pressure; Piezoelectric Transducers; Phased Arrays; Liquids; Acoustic Streaming

20000048285 Illinois Univ. at Urbana-Champaign, Dept. of Mechanical and Industrial Engineering, Urbana, IL USA
Global Two-Scalar Velocimetry and Development of Low-Order Models for Use in Optical-Phase Correction in a Plane Mixing Layer ***Final Report, 1 Apr. 1995 - 30 Sep. 1998***
Pearlstein, Arne J.; Mar. 04, 2000; 47p; In English
Contract(s)/Grant(s): F49620-95-1-0297
Report No.(s): AD-A376026; AFRL-SR-BL-TR-00-0096; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Work was conducted on two projects related to control of shear flows. In the first, two-dimensional simulations were performed to study the effects of resolution on the extraction of velocity data from measurements of scalar fields in incompressible flows. That work demonstrates ”proof-of concept” for the methodology described in earlier work supported by AFOSR. In the second, we developed a general-purpose algorithm for computing all solutions of an arbitrary system of multivariate polynomial equations. That work constitutes the basis of a technique for determining the coefficients in low-order models of scalar transport in turbulent shear flows. The polynomial root-finder has been applied to construction of low-order models of scalar transport in a turbulent plane mixing layer.
DTIC
Velocity Measurement; Computational Fluid Dynamics

20000048286 Notre Dame Univ., Dept. of Aerospace and Mechanical Engineering, IN USA
Fluid-Optic Interactions II ***Final Report, 1 Jul. 1997 - 31 Dec. 1998***
Jumper, Eric J.; Mar. 22, 2000; 69p; In English
Contract(s)/Grant(s): F49620-97-1-0489; AF Proj. 2308
Report No.(s): AD-A376028; AFRL-SR-BL-TR-00-0098; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes fluid-optic interaction research at the University of Notre Dame. When a laser beam propagates through a variable-index-of-refraction, turbulent fluid, its optical wavefront becomes aberrated, reducing associated optical system performance. For flight above 0.6 Mach, ”compressibility effects” alone become important in aberrating wavefronts. Scaling optical wavefront data collected in ground-test facilities to realistic flight conditions requires an understanding of the compressibility mechanism that produces wavefront distortions This mechanism was studied using an analytical/numerical model. Shear-layer flows of low convective Mach number can be considered weakly-compressible, which allowed their velocity fields to be approximated using a discrete vortex method. From these ”known” velocity fields, the concomitant pressure and density fields were determined by iteratively solving the unsteady Euler equations. The results showed that unsteady pressure fluctuations present in shear layers had a dominant effect on the resulting density/Index fields; this effect has historically been neglected. The computed index fields produced simulated schlieren images which closely resembled experimental schlierens. Optical wavefronts computed from

the simulation reasonably matched the behavior of large-scale aberrations measured in a transonic wind tunnel at AEDC. The compressibility model was used to suggest and test relations for scaling optical wavefronts from one flow condition to another. A simple density ratio successfully scaled distortion variations with altitude when shear layer Mach numbers were held constant; an additional temperature ratio was required if the velocity difference was kept the same. The spatial and temporal frequencies of optical distortions produced by dissimilar-index, incompressible, mixing flows were found to logically scale, provided the beam's diameter was larger than the largest flow structures.
DTIC
Adaptive Optics; Wave Fronts; Computational Fluid Dynamics

20000048497 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Existence and Uniqueness of Solutions to the Boussinesq System with Nonlinear Thermal Diffusion. Modelling, Analysis and Simulation
Diaz, J. I., Center for Mathematics and Computer Science, Netherlands; Galiano, G., Center for Mathematics and Computer Science, Netherlands; Sep. 1997; 30p; In English
Report No.(s): PB2000-104700; MAS-R9722; Copyright; Avail: National Technical Information Service (NTIS)
The Boussinesq system arises in fluid mechanics when motion is governed by density gradients caused by temperature or concentration differences. In the former case and when thermodynamical coefficients are regarded as temperature dependent, the system consists of the Navier-Stokes equations and the nonlinear heat equation coupled through the viscosity, buoyancy, and convective terms. According to the balance between specific heat and thermal conductivity, the diffusion term in the heat equation may lead to a singular or degenerate parabolic equation. In this paper, we prove the existence of solutions of the general problem as well as the uniqueness of solutions when the spatial dimension is two.
NTIS
Thermal Diffusion; Differential Equations; Convection; Nonlinearity; Temperature Dependence

20000048803 Technische Hogeschool Twente, Faculty of Applied Mathematics, Enschede, Netherlands
LES: A Review and Open Problems. Seminar
Germano, M., Turin Univ., Italy; Dec. 1997; 20p; In English
Report No.(s): PB2000-103751; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Only for low values of the Reynolds number and for simple geometries is it presently possible to compute a turbulent motion in all details by doing a so called Direct Numerical Simulation. This has promoted the interest for a more economical procedure, the Large Eddy Simulation, where only the large scales of a turbulent motion are numerically solved. This technique requires, first a definition of the resolved quantities that the authors intend to compute, and second a model to represent the effect of the unresolved scales. These two basic points are reviewed from a general point of view and in the second part different modeling procedures and open problems in their application to complex flows discussed.
NTIS
Conferences; Large Eddy Simulation; Turbulent Flow; Computation; Direct Numerical Simulation

20000050240 West Virginia Univ., Mechanical and Aerospace Engineering Dept., Morgantown, WV USA
Investigation of Point Doppler Velocimetry (PDV) for Transition Detection in Boundary Layers *Final Report*
Kuhlman, John, West Virginia Univ., USA; [1999]; 51p; In English
Contract(s)/Grant(s): F49620-94-I-0434; F49620-98-I-0068; NAG1-1892; NAG1-2132; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A two-component Point Doppler Velocimeter (PDV) system has been improved through the use of vapor-limited iodine cells that have responses that are insensitive to temperature variations. Two-component PDV velocity measurements have been obtained for a 1 inch diameter uniform circular jet flow at a nominal exit velocity of 60 m/sec, corresponding to a Reynolds number of 100,000. Similar data have also been obtained for an annular jet and a swirling jet, These PDV data runs have been duplicated to judge the repeatability of these measurements, and also have been compared with hot wire anemometer data for the same flow conditions. PDV mean velocity results are repeatable to within approximately 1-2 meters per second; the PDV RMS velocity results are also quite repeatable. Exit profiles of PDV mean axial velocity data generally agree with hot wire anemometer results to within about 2 meters per second as well. However, the PDV RMS velocity results are consistently lower than the hot wire results everywhere but at the exit of the standard jet, where they are too high relative to the hot wire data. This is believed to at least be partially due to the method used to compute the RMS (Root Mean Square).
Author
Boundary Layers; Velocity Measurement; Laser Doppler Velocimeters; Jet Flow; Detection

20000050268 Department of the Navy, Washington, DC USA

System for Suppressing Cavitation in a Hydraulic Component

Ruffa, Anthony A., Inventor; Dec. 07, 1999; 5p; In English; Supersedes US-Patent-Appl-SN-09/045888

Patent Info.: Filed 18 Mar. 1998; US-Patent-5,996,630; US-Patent-Appl-SN-09/045,888

Report No.(s): AD-D019643; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A system is provided for suppressing flow-induced cavitation in a fluid flow. At least one acoustic transducer is coupled to the fluid flow in a region that is susceptible to the formation of cavitation bubbles The transducer (or transducers) applies an acoustic field to the fluid flow in order to raise the cavitation threshold pressure of the fluid flow above the total local pressure including the pressure drop induced by the fluid flow and the pressure due to the acoustic field,

DTIC

Suppressors; Cavitation Flow; Sound Fields; Acoustics; Patents

20000052490 Technische Hogeschool Twente, Faculty of Mathematical Sciences, Enschede, Netherlands

Implicit Time Accurate Simulation of Unsteady Flow

vanBuuren, R.; Kuerten, J. G. M.; Geurts, B. J.; Jun. 1998; 66p; In English

Report No.(s): PB2000-103771; No Copyright; Avail: National Technical Information Service (NTIS)

In this paper the authors study the properties of an implicit time integration method for the simulation of unsteady shock boundary layer interaction flow. Using an explicit second order Runge-Kutta scheme the authors determine a reference solution for the implicit second order Crank Nicolson scheme. This A-stable scheme allows the time step to be determined solely by the resolution requirements of the unsteady flow phenomena. The nonlinear equations which result from the temporal and spatial discretization are solved iteratively by adding a pseudo time derivative to which the Euler backward scheme is applied. The linear system arising after discretization in pseudo time is solved approximately with a symmetric block Gauss-Seidel solver. As a criterion for the accuracy of the solution the authors relate the global error caused by the temporal integration to the error resulting from the spatial discretization. The authors study the dependence of the accuracy of the solution on the time step and the accuracy with which the solution is determined at each instant.

NTIS

Accuracy; Unsteady Flow; Boundary Layer Flow; Computational Fluid Dynamics

20000052496 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

Simultaneous velocimetry and thermometry of air using nonresonant heterodyne laser-induced thermal acoustics *Final Report*

Hart, Roger C., Institute for Computer Applications in Science and Engineering, USA; Balla, R. Jeffrey, NASA Langley Research Center, USA; Herring, G. C., NASA Langley Research Center, USA; May 2000; 12p; In English

Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01

Report No.(s): NASA/CR-2000-210118; NAS 1.26:210118; ICASE-2000-22; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Nonresonant laser-induced thermal acoustics (LITA) is employed with heterodyne detection to measure temperature (285-295 K) and a single component of velocity (20-150 m/s) in an atmospheric pressure, subsonic, unseeded air jet. Good agreement is found with pitot-tube measurements of velocity (0.2% at 150 m/s and 2% at 20 m/s) and the isentropic expansion model for temperature (0.3%).

Author

Velocity Measurement; Temperature Measurement; Heterodyning; Optical Measurement; Nonintrusive Measurement; Lasers; Gas Jets; Subsonic Flow

20000052498 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

Optical measurement of the speed of sound in air over the temperature range 300-650 K *Final Report*

Hart, Roger C., Institute for Computer Applications in Science and Engineering, USA; Balla, R. Jeffrey, NASA Langley Research Center, USA; Herring, G. C., NASA Langley Research Center, USA; April 2000; 9p; In English

Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01

Report No.(s): NASA/CR-2000-210114; NAS 1.26:210114; ICASE-2000-20; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Using laser-induced thermal acoustics (LITA), the speed of sound in room air (1 atm) is measured over the temperature range 300-650 K. Since the LITA apparatus maintains a fixed sound wavelength as temperature is varied, this temperature range simulta-

neously corresponds to a sound frequency range 10-15 MHz. The data are compared to a published model and typically agree within 0.1-0.4% at each of 21 temperatures.
Author
Optical Measurement; Temperature Dependence; Velocity Measurement; Acoustic Velocity; Optical Measuring Instruments; Lasers

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INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see 43 Earth Resources and Remote Sensing. For related information see also 06 Avionics and Aircraft Instrumentation; and 19 Spacecraft Instrumentation.

20000044886 Rutherford Appleton Lab., Chilton, UK
Excitations
ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 16-17; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

The Excitations Group operates four scheduled instruments, HET, MARI, PRISMA and ROTAX; the installation of a fifth instrument, the novel MAPS spectrometer has just been completed and the technical and scientific commissioning has started. The Group is also in charge of the single crystal alignment and characterization facility, ALF, located on ROTAX.
Author
Excitation; Atomic Energy Levels; Atomic Interactions

20000045696 NASA Pasadena Office, CA USA
Micromachined Thermoelectric Sensors and Arrays and Process for Producing
Foote, Marc C., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Jones, Eric W., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Caillat, Thierry, Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Apr. 04, 2000; 36p; In English
Patent Info.: Filed 4 Nov. 1998; NASA-Case-NPO-20402-1-CU; US-Patent-6,046,398; US-Patent-Appl-SN-190416; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Linear arrays with up to 63 micromachined thermopile infrared detectors on silicon substrates have been constructed and tested. Each detector consists of a suspended silicon nitride membrane with 11 thermocouples of sputtered Bi-Te and Bi-Sb-Te thermoelectric elements films. At room temperature and under vacuum these detectors exhibit response times of 99 ms, zero frequency D* values of 1.4 x 10(exp 9) cmHz(exp 1/2)/W and responsivity values of 1100 V/W when viewing a 1000 K blackbody source. The only measured source of noise above 20 mHz is Johnson noise from the detector resistance. These results represent the best performance reported to date for an array of thermopile detectors. The arrays are well suited for uncooled dispersive point spectrometers. In another embodiment, also with Bi-Te and Bi-Sb-Te thermoelectric materials on micromachined silicon nitride membranes, detector arrays have been produced with D* values as high as 2.2 x 10(exp 9) cm Hz(exp 1/2)/W for 83 ms response times.
Author
Micromachining; Thermoelectric Materials; Linear Arrays; Infrared Detectors; Thermopiles; Silicon Nitrides

20000046608 Ljubljana Univ., Faculty of Electrical Engineering, Ljubljana, Slovenia
National Standard for Thermodynamic Temperature
Bojkovski, Jovan, Ljubljana Univ., Slovenia; Drnovsek, Janko, Ljubljana Univ., Slovenia; Pusnik, Igor, Ljubljana Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 1, pp. 62-66; In English; Copyright; Avail: Issuing Activity

The article describes the Slovenian national standard for thermodynamic temperature and the reference standard for relative humidity. Both standards, which are kept and maintained by the Laboratory of Metrology and Quality at the Faculty of Electrical Engineering in Ljubljana, provide traceability of temperature and relative humidity to international standards. Their dissemination to working and other standards is performed in an accredited laboratory in compliance with accredited calibration procedures.
Author
Atmospheric Temperature; Thermodynamics; Metrology; Standards; Humidity

20000046791 NASA Lewis Research Center, Cleveland, OH USA

Gas Sensing Diode and Method of Manufacturing

Hunter, Gary William, Inventor, NASA Lewis Research Center, USA; Feb. 22, 2000; 12p; In English

Patent Info.: Filed 29 May 1998; NASA-Case-LEW-16519-1; US-Patent-6,027,954; US-Patent-Appl-SN-093840; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A diode for sensing hydrogen and hydrocarbons and the process for manufacturing the diode are disclosed. The diode is a Schottky diode which has a palladium chrome contact on the C-face of an n-type 6H Silicon carbide epilayer. The epilayer is grown on the C-face of a 6H silicon carbide substrate. The diode is capable of measuring low concentrations of hydrogen and hydrocarbons at high temperatures, for example, 800 C. The diode is both sensitive and stable at elevated temperatures.

Author

Detection; Gas Analysis; Hydrogen; Sensitivity; Schottky Diodes; Manufacturing

20000048258 NASA Langley Research Center, Hampton, VA USA

Method of Forming Micro-Sensor Thin-Film Anemometer

Sheplak, Mark, Inventor, NASA Langley Research Center, USA; McGinley, Catherine B., Inventor, NASA Langley Research Center, USA; Spina, Eric F., Inventor, NASA Langley Research Center, USA; Stephens, Ralph M., Inventor, NASA Langley Research Center, USA; Hopson, Purnell, Jr., Inventor, NASA Langley Research Center, USA; Cruz, Vincent B., Inventor, NASA Langley Research Center, USA; Feb. 01, 2000; 8p; In English; Division of US-Patent-Appl-SN-361601, filed 21 Nov. 1994

Patent Info.: Filed 15 Aug. 1996; NASA-Case-LAR-15112-2-CU; US-Patent-6,018,861; US-Patent-Appl-SN-698559; US-Patent-Appl-SN-361601; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A device for measuring turbulence in high-speed flows is provided which includes a micro- sensor thin-film probe. The probe is formed from a single crystal of aluminum oxide having a 14 deg half-wedge shaped portion. The tip of the half-wedge is rounded and has a thin-film sensor attached along the stagnation line. The bottom surface of the half-wedge is tilted upward to relieve shock induced disturbances created by the curved tip of the half-wedge. The sensor is applied using a microphotolithography technique.

Official Gazette of the U.S. Patent and Trademark Office

Procedures; Anemometers; Thin Films; Turbulence

20000048381 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Low Power Cryogenic Shutter Mechanism for Use in Infrared Imagers

Schwinger, D. Scott, NASA Goddard Space Flight Center, USA; Hakun, Claef F., NASA Goddard Space Flight Center, USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 1-14; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper discusses the requirements, design, operation, and testing of the shutter mechanism for the Infrared Array Camera (IRAC). The shutter moves a mirror panel into or out of the incoming light path transitioning IRAC between data acquisition and calibration modes. The mechanism features a torsion flexure suspension system, two low-power rotary actuators, a balanced shaft, and a variable reluctance position sensor. Each of these items is discussed along with problems encountered during development and the implemented solutions.

Author

Cryogenics; Camera Shutters; Infrared Radiation

20000048382 Smithsonian Astrophysical Observatory, Cambridge, MA USA

ACIS Door Failure Investigation and Mitigation Procedures

Podgorski, William A., Smithsonian Astrophysical Observatory, USA; Tice, Neil W., Lockheed Martin Space Systems Co., USA; Plucinsky, Paul P., Smithsonian Astrophysical Observatory, USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 15-28; In English; See also 20000048380

Contract(s)/Grant(s): NAS8-39073; SC-A-124624; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

NASA's Chandra X-ray Observatory (formerly AXAF) was launched on July 23, 1999 and is currently in orbit performing scientific studies. Chandra is the third of NASA's Great Observatories to be launched, following the Hubble Space Telescope and the Compton Gamma Ray Observatory. One of four primary science instruments on Chandra, and one of only two focal plane instruments, is the Advanced CCD Imaging Spectrometer, or ACIS. The ACIS focal plane and Optical Blocking Filter (OBF) must be launched under vacuum, so a tightly sealed, functioning door and venting subsystem were implemented. The door was opened two and one-half weeks after launch (after most out-gassing of composite materials) and allowed X-rays to be imaged by the ACIS CCD's in the focal plane. A failure of this door to open on-orbit would have eliminated all ACIS capabilities, severely degrading mission science. During the final pre-flight thermal-vacuum test of the fully integrated Chandra Observatory at TRW, the ACIS

door failed to open when commanded to do so. This paper describes the efforts, under considerable time pressure, by NASA, its contractors and outside review teams to investigate the failure and to develop modified hardware and procedures which would correct the problem. of interest is the fact that the root cause of the test failure was never clearly identified despite massive effort. We ultimately focussed on hardware and procedures designed to mitigate the effects of potential, but unproven, failure modes. We describe a frequent real-world engineering situation in which one must proceed on the best basis possible in the absence of the complete set of facts.
Author
X Ray Astrophysics Facility; Spaceborne Astronomy; X Ray Astronomy; Charge Coupled Devices; Imaging Spectrometers; Focal Plane Devices; Optical Filters

20000048391 Schaeffer Magnetics, Inc., Chatsworth, CA USA
Development of a Cryogenic Nanometer-Class Repeatability Linear Actuator
Nalbandian, Ruben, Schaeffer Magnetics, Inc., USA; Hatheway, Alson E., Hatheway (Alson E.), Inc., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 131-136; In English; See also 20000048380; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The goal of the Nanometer Resolution Linear Actuator development project was to demonstrate an extremely light weight, very high precision and high stiffness actuator capable of operating uniformly well over the temperature range of 20K to 300K. The development was a joint effort between Alson E. Hatheway, Inc. (AEH) and Moog, Schaeffer Magnetics Division (SMD), for use in spacecraft optical instruments, notably the Next Generation Space Telescope (NGST). This paper describes the design challenge of developing a lightweight, compact (35 mm diameter by 100 mm length), high stiffness, low power, thermally stable linear positioning mechanism. The key to achieving high resolution, low power, and stability is to eliminate the closed-loop control system that is normally applied to overcome non-linearities and hysteresis inherent in some technologies, such as piezoelectric and magnetostrictive transducers. This was accomplished by using AEH's patented elastic Rubicon transducer techniques that are inherently linear and hysteresis free.
Author
Cryogenic Equipment; Cryogenics; Linearity; Actuators; Spacecraft Instruments; Next Generation Space Telescope Project; Spaceborne Telescopes

20000048399 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Development of a Miniature, Two-Axis, Triple-Helmholtz-Driven Gimbal
Sharif, Boz, Aeroflex Labs., Inc., USA; Joscelyn, Ed, Aeroflex Labs., Inc., USA; Wilcox, Brian, Jet Propulsion Lab., California Inst. of Tech., USA; Johnson, Michael R., Jet Propulsion Lab., California Inst. of Tech., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 189-198; In English; See also 20000048380; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

This paper details the development of a Helmholtz-driven, 2-axis gimbal to position a flat mirror within 50 microradian (fine positioning) in a space environment. The gimbal is intended to travel on a deep space mission mounted on a miniature "rover" vehicle. The gimbal will perform both pointing and scanning functions. The goal for total mass of the gimbal was 25 grams. The primary challenge was to design and build a bearing system that would achieve the required accuracy in addition to supporting the relatively large mass of the mirror and the outer gimbal. The mechanism is subjected to 100-G loading without the aid of any additional caging mechanism. Additionally, it was desired to have the same level of accuracy during Earth-bound, 1-G testing. Due to the inherent lack of damping in a zero-G, vacuum environment; the ability of the gimbal to respond to very small amounts of input energy is paramount. Initial testing of the first prototype revealed exceedingly long damping times required even while exposed to the damping effects of air and 1-G friction. It is envisioned that fine positioning of the gimbal will be accomplished in very small steps to avoid large disturbances to the mirror. Various bearing designs, including materials, lubrication options and bearing geometry will be discussed. In addition various options for the Helmholtz coil design will be explored with specific test data given. Ground testing in the presence of 1-G was compounded by the local magnetic fields due to the "compass" effect on the gimbal. The test data will be presented and discussed. Additionally, rationale for estimating gimbal performance in a zero-G environment will be presented and discussed.
Author
Miniaturization; Gimbals; Bearings; Mirrors; Positioning; Design Analysis

20000048628 Department of the Navy, Washington, DC USA

Rapid, High-Resolution Scanning of Flat and Curved Regions for Gated Optical Imaging

Bashkansky, Mark, Inventor; Duncan, Michael, Inventor; Reintjes, John, Inventor; Mar. 31, 1998; 22p; In English

Patent Info.: Filed 31 Mar. 1998; US-Patent-Appl-SN-09,050,964

Report No.(s): AD-D019627; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A scanning system for scanning in first and second dimensions a desired surface topology of a sample, the scanning device comprising: a light source for producing a collimated light beam; a first scanning device responsive to the collimated light beam from the light source for producing a first scanned beam in a first dimension with a constant optical path length; and a second scanning device coupled between the first scanning device and the sample for focusing and scanning the first scanned beam in a second dimension onto the surface region of the sample to cause the collimated light beam to scan the surface topology of the sample with a constant optical path length in each of the first and second dimensions of the desired topology of the sample. In a second embodiment of the invention, a beam of light is focused by a first lens before a scanner and the scanner is rotated. Second and third lenses arranged in a 4 - f combination are used to image rotated focal spots along a spherical convex surface of a sample while the optical path length stays constant. Slow scanning in other dimensions can be performed by mechanical means.

DTIC

High Resolution; Scanning; Topology; Imaging Techniques; Scanners; Patent Applications

20000050236 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Extended Logic Intelligent Processing System for a Sensor Fusion Processor Hardware

Stoica, Adrian, Jet Propulsion Lab., California Inst. of Tech., USA; Thomas, Tyson, Jet Propulsion Lab., California Inst. of Tech., USA; Li, Wei-Te, Jet Propulsion Lab., California Inst. of Tech., USA; Daud, Taher, Jet Propulsion Lab., California Inst. of Tech., USA; Fabunmi, James, AEDAR Corp., USA; [2000]; 8p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The paper presents the hardware implementation and initial tests from a low-power, highspeed reconfigurable sensor fusion processor. The Extended Logic Intelligent Processing System (ELIPS) is described, which combines rule-based systems, fuzzy logic, and neural networks to achieve parallel fusion of sensor signals in compact low power VLSI. The development of the ELIPS concept is being done to demonstrate the interceptor functionality which particularly underlines the high speed and low power requirements. The hardware programmability allows the processor to reconfigure into different machines, taking the most efficient hardware implementation during each phase of information processing. Processing speeds of microseconds have been demonstrated using our test hardware.

Author

Data Processing; Hardware; Performance Tests; Multisensor Fusion

20000050237 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Temperature Stabilization Requirements for Unchopped Thermal Detectors

Foote, Marc C., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 7p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The temperature stabilization requirements of unchopped thermistor bolometers and thermopile detectors are analyzed. The detector temperature, on which the bolometer output signal depends, is quite sensitive to changes in instrument temperature but relatively insensitive to changes in scene temperature. In contrast, the difference in temperature between detector and substrate (instrument), on which the thermopile signal depends, is equally sensitive to changes in instrument and scene temperature. Expressions for these dependencies are derived based on a simplified instrument model. It is shown that for a typical uncooled thermal imager, the temperature stabilization requirements for a bolometer are two orders of magnitude more stringent than those for a thermopile detector. Keywords: thermistor, bolometer, thermopile, detector, IR, thermal, temperature stabilization

Author

Temperature Control; Measuring Instruments; Stabilization; Thermistors

20000050246 Department of Energy, Office of Energy Research, Washington, DC USA

Coplanar-grid CdZnTe detector with three-dimensional position sensitivity

Luke, P. N.; Amman, M.; Lee, J. S.; Yaver, H.; Jun. 30, 1998; 19p; In English; 18th; Semiconductor detectors, new developments in radiation detectors

Report No.(s): DE98-059372; LBNL-41480; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A 3-dimensional position-sensitive coplanar-grid detector design for use with compound semiconductors is described. This detector design maintains the advantage of a coplanar-grid detector in which good energy resolution can be obtained from materi-

als with poor charge transport. Position readout in two dimensions is accomplished using proximity-sensing electrodes adjacent to the electron-collecting grid electrode of the detector. Additionally, depth information is obtained by taking the ratio of the amplitudes of the collecting grid signal and the cathode signal. Experimental results from a prototype CdZnTe detector are presented.
NTIS
Planar Structures; Detectors

20000050269 Department of the Navy, Washington, DC USA
Method and Apparatus for Infrared Detection of a Moving Target in the Presence of Solar Clutter
Crosby, Holmes, Inventor; Wardlaw, Michael J., Inventor; Dec. 07, 1999; 20p; In English; Supersedes US-Patent-Appl-SN-08/903250, AD-D018603
Patent Info.: Filed 31 Jul. 1997; US-Patent-5,999,212; US-Patent-Appl-SN-08/903,250
Report No.(s): AD-D019642; No Copyright; Avail: US Patent and Trademark Office, Microfiche

This patent discloses a detection system for detecting a target flying over water, which includes a detector positioned to receive radiation reflected by the target off the water, and producing a detector output signal having an amplitude proportional to the amount of received radiation, a high-pass filter for passing portions of the detector output signal having a frequency greater than a prescribed threshold frequency, and for blocking portions of the detector output signal having a frequency lower than the prescribed threshold frequency. The prescribed threshold frequency is sufficiently high to ensure that only the portions of the detector output signal produced by the radiation reflected by the target off the water are passed by the high-pass filter, and that portions of the detector output signal produced by solar glitter are not passed. In a specific embodiment, the system is designed to be installed on a ship for the purpose of detecting low-flying, fast-moving targets, such as cruise missiles.
DTIC
Infrared Detectors; Infrared Signatures; Infrared Radiation; Target Recognition; Targets; Target Acquisition; Moving Target Indicators

20000050276 Department of the Navy, Washington, DC USA
Method Using Corrective Factors for Determining a Magnetic Gradient
Frommer, Stephen W., Inventor; Penfold, Barry, Inventor; Nov. 23, 1999; 23p; In English; Supersedes US-Patent-Appl-SN-08/955618
Patent Info.: Filed 22 Oct. 1997; US-Patent-5,990,679; US-Patent-Appl-SN-08/955,618
Report No.(s): AD-D019635; No Copyright; Avail: US Patent and Trademark Office, Microfiche

Inventive electrical-computational method and system for aligning a magnetic gradiometer, and for determining magnetic gradients using a magnetic gradiometer which is inventively aligned. For each correlation of a correction magnetometer's vector with a reference magnetometer's vector, three correction coefficients and an offset coefficient are evaluated, using a mathematical approximation technique (such as least-squares) upon voltage outputs for various relative orientations of magnetic fields in relation to a magnetic gradiometer. An inventive matrix formula is used for determining magnetic gradients. A correction magnetometer matrix (matrix of voltages generated by each correction vector of the correction magnetometer) is multiplied by a coefficient matrix (matrix of correction and offset coefficients). The correction vectors within the correction magnetometer matrix are thus aligned with the reference vectors within the reference magnetometer matrix (matrix of voltages generated by each reference vector of the reference magnetometer) whereby, for each magnetic gradient determination pursuant to a correlation of a reference vector with a correction vector, any deviation from zero represents the magnetic gradient for that correlation. Many inventive embodiments incorporate temperature compensation, whereby the inventive practitioner establishes variations of correction and offset coefficients in accordance with temperature. With the assistance of computational electronics, inventive gradiometer alignments can he accomplished considerably more speedily than can gradiometer alignments according to conventional mechanical methodologies.
DTIC
Magnetometers; Gravity Gradiometers; Gradients

20000051487 Old Dominion Univ., Microelectronics Research Lab., Norfolk, VA USA
A Diamond Electron Tunneling Micro-Electromechanical Sensor ***Final Report***
Albin, Sacharia, Old Dominion Univ., USA; May 12, 2000; 110p; In English
Contract(s)/Grant(s): NAG1-1995; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A new type of pressure sensor has been fabricated through the micro-machining of silicon. It consists of two structures: a diamond coated nano-tip array and a diaphragm. The processes used to form each structure have been discussed. The array consists of 400 tips arranged in a 20 x 20 configuration. Although the region of operation of the sensor is lower on the exponential curve

than expected, the average sensitivity was found to be 2.13 millivolts per volt per psi over the range of applied voltages, which is comparable to piezo-resistive and capacitive pressure sensors using silicon diaphragms fabricated in a similar manner to the ones used here. The structures bonded in air at atmospheric pressure exhibited discharge effects due to ionization; this effect was minimized by sealing the devices in helium. Temperature dependence of the sensors was noted.
Derived from text
Fabrication; Diamonds; Electromechanics; Electron Tunneling; Gas Pressure; Pressure Sensors; Machining

36
LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also 76 Solid-State Physics.

20000048491 Massachusetts Inst. of Tech., Lab. of Electronics, Cambridge, MA USA
Asynchronous Mode Locking of Fiber Lasers ***Final Report, 1 Aug. 1995-31 Jul. 1998***
Ippen, Erich P.; Mar. 13, 2000; 6p; In English
Contract(s)/Grant(s): F49620-95-1-0435; AF Proj. 3484
Report No.(s): AD-A375829; AFRL-SR-BL-TR-00-0088; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This project resulted in the development of several novel optical fiber lasers designed to generate short pulses for optical communication networks and for optical signal processing. The concept of using asynchronous modulation for stable soliton generation was developed and extended successfully to optical memory loops. Laser designs for reduced sensitivity to environmental perturbations were investigated and important properties of dispersion management revealed. A compact geometry was demonstrated using a doped, planar waveguide amplifier and the shortest soliton pulses to-date, from a fiber source were achieved.
DTIC
Fiber Optics; Fabrication; Optical Communication; Fiber Lasers; Optical Data Processing; Optical Fibers; Optical Memory (Data Storage)

20000052244 Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
Study of the electron kinetic processes in the breakdown of argon by optical laser radiation
Gamal, Y. E. E.; Mar. 31, 1999; 30p; In English
Report No.(s): DE99-627831; IC-IR-99/3; No Copyright; Avail: Department of Energy Information Bridge
Basing on a previously developed electron cascade model by Evans and Gamal (1980), a study is performed to investigate the electron kinetics in the breakdown of argon by an optical frequency laser radiation (0.53 (mu)m) with pulse length 15 ns. The model solves simultaneously the time dependent Boltzmann equation for the electron energy distribution function and a set of rate equations describing the rate of change of the population density of the formed excited states. The model takes into account all the possible electron, atom and photon interactions. The actual correlation between the cross-sections and rate coefficients of the possible physical processes and the electron energy is considered in this analysis. The computations are carried out under the experimental conditions of Rosen and Weyl (1987). The calculated breakdown parameters are found to be in accordance with the measured ones. Moreover, the importance of each loss process considered in this work as well as the contribution of the secondary ionization processes are tested over the pressure range examined experimentally. It is shown that at low pressure regime breakdown is governed by a diffusion loss process while at high pressures recombination losses dominate. On the other hand, the secondary ionization processes are acting effectively to overcome these loss processes over the whole pressure range.
NTIS
Electron Energy; Argon Lasers; Laser Beams

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see 63 Cybernetics, Artificial Intelligence, and Robotics; and 54 Man/System Technology and Life Support.

20000045718 Department of the Navy, Washington, DC USA
Air Supply System Particularly Suited to Remove Contaminants Created by Chemical, Biological or Radiological Conditions
LaMoy, Craig S., Inventor; Pompeii, Michael A., Inventor; Atwell, Charles K., Inventor; Craig, W. D., Inventor; Repp, Bradley A., Inventor; Feb. 15, 2000; 21p; In English
Patent Info.: Filed 15 Feb. 2000; US-Patent-Appl-SN-9,504,396
Report No.(s): AD-D019620; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Disclosed is an air supply system that provides filtered ventilation to a protected zone which is maintained at a positive pressure so as to prevent contaminants from infiltrating therein. The system further discloses a three-stage air filter apparatus that provides all the necessary filtering to remove contaminants from the air that may be created by chemical, biological and radiological conditions.
DTIC
Contaminants; Air Sampling; Air Pollution; Radiology; Chemical Warfare

20000048255 NASA Langley Research Center, Hampton, VA USA
Explosive Joining for the Mars Sample Return Mission
Bement, Laurence J., NASA Langley Research Center, USA; Sanok, Joseph T., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 14p; In English; 36th; 36th Joint Propulsion Conference and Exhibit, 17-19 Jul. 2000, Huntsville, AL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-3406; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A unique, small-scale, ribbon explosive joining process is being developed as an option for closing and sealing a metal canister to allow the return of a pristine sample of the Martian surface and atmosphere to Earth. This joining process is accomplished by an explosively driven, high-velocity, angular collision of the metal, which melts and effaces the oxide films from the surfaces to allow valence electron sharing to bond the interface. Significant progress has been made through more than 100 experimental tests to meet the goals of this ongoing developmental effort. The metal of choice, aluminum alloy 6061, has been joined in multiple interface configurations and in complete cylinders. This process can accommodate dust and debris on the surfaces to be joined. It can both create and sever a joint at its midpoint with one explosive input. Finally, an approach has been demonstrated that can capture the back blast from the explosive.
Author
Aluminum Alloys; Mars Atmosphere; Mars Sample Return Missions; Mars Surface; Sealing; Explosives

20000048261 NASA Lewis Research Center, Cleveland, OH USA
Resilient Braided Rope Seal
Steinetz, Bruce M., Inventor, NASA Lewis Research Center, USA; Kren, Lawrence A., Inventor, NASA Lewis Research Center, USA; Mar. 21, 2000; 12p; In English; Continuation-in-part of abandoned US-Patent-Appl-SN-739342, filed 17 Oct. 1996
Patent Info.: Filed 9 Apr. 1998; NASA-Case-LEW-16231-2; US-Patent-6,039,325; US-Patent-Appl-SN-057898; US-Patent-Appl-SN-739342; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A resilient braided rope seal for use in high temperature applications includes a center core of fibers. a resilient canted spring member supporting the core and at least one layer of braided sheath fibers tightly packed together overlying the spring member. The seal provides both improved load bearing and resiliency. Permanent set and hysteresis are greatly reduced.
Official Gazette of the U.S. Patent and Trademark Office
High Temperature; Hysteresis; Seals (Stoppers)

20000048394 Hi-Shear Technology Corp., Torrance, CA USA
The Development of an Ultra Low Shock Pyrotechnically Actuated Separation Nut
Silverman, Fred, Hi-Shear Technology Corp., USA; OQuinn, Jerry, Hi-Shear Technology Corp., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 151-155; In English; See also 20000048380; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

As spacecraft have become vastly more sophisticated with a myriad of sensitive and complex components, the concern caused by mechanical and pyrotechnic shock has increased. Looking for solutions to the problem Hi-Shear Technology Corporation (HSTC) is developing an ultra low shock separation nut that reduces the peak output shock by approximately 50% of the HSTC flight-qualified low-shock separation nuts, which are presently one of the lowest mechanical/pyrotechnic shock producing devices. The ultra low shock separation nut (Patent Case Number 4931) uses a rotor feature that converts much of the shock energy from an axial direction into rotation and increases the preload release time, thereby decreasing the peak output shock.
Author
Mechanical Shock; Shock Resistance; Pyrotechnics; Shock Wave Generators

20000048395 Oceaneering Space Systems, Houston, TX USA
Piezoelectric Pump Development
Sager, Franklin E., Oceaneering Space Systems, USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 157-162; In English; See also 20000048380; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The primary objective of the piezoelectric pump program is the development of enabling pump technology for space applications. Pumps under development are characterized by reduced mechanical complexity, increased reliability, improved efficiency, reduced volume, and reduced weight, with respect to conventional pumps. With a combination of sponsor and internal funding, two generations of pump designs were built and tested. The main products were design understanding and sizing equations, and a marked improvement in pump performance as the design evolved. The basic engineering developed on this project has broad aerospace applications.
Author
Piezoelectricity; Pumps; Research and Development; Design Analysis; Technology Utilization; Aerospace Engineering

20000048400 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Cover Drive and Lock Ring Mechanisms for Genesis
Jandura, Louise, Jet Propulsion Lab., California Inst. of Tech., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 199-212; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Genesis payload canister will return solar wind samples to Earth. The canister contains four mechanism assemblies: the Cover Drive Mechanism, the Lock Ring Mechanism, the Array Deployment Mechanism, and the Array Latch Mechanism. The Cover Drive and Lock Ring Mechanisms are described in detail while the other two mechanisms are briefly summarized. The Engineering Model canister has been designed, built, tested, and delivered to the spacecraft. The Flight Model is currently being built with delivery to the spacecraft scheduled for mid July 2000. Launch is scheduled for January 2001
Author
Genesis Mission; Earth Magnetosphere; Solar Wind; Cans

20000048403 ILC Dover, Frederica, DE USA
Inflatable Boom Controlled Deployment Mechanism for the Inflatable Sunshield in Space (ISIS) Flight Experiment
Sapna, George H., III, ILC Dover, USA; Folke, John, ILC Dover, USA; Sandy, Charles R., ILC Dover, USA; Cadogan, David P., ILC Dover, USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 231-238; In English; See also 20000048380; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

ILC Dover, Inc. has developed the wire brake Controlled Deployment Mechanism (CDM) for use in the Inflatable Sunshield In Space (ISIS) Shuttle flight experiment. The ISIS experiment is a 1/3-scale sunshield demonstration unit precursor to the Next Generation Space Telescope (NGST). The NGST sunshield is a 35 x 15 meter diamond-shaped multi-membrane sunshield that will be used to passively protect the telescope from thermal radiation and stray light. The ISIS requirements call for a smooth and predictable deployment of the sunshield by inflatable booms that are governed by the wire brake CDM. to deploy the sunshield, inflation gas is introduced into the inflatable booms, which gives them rigidity and causes them to unroll from the stowed position. As the boom is inflated, the torsional resistance of the wire brake device causes the pressure in the booms to increase until the point where it overcomes the torsional resistance of the wire brake and the boom unrolls. The wire brake operates by converting mechanical energy to heat through the plastic deformation of a ductile metal wire. Associated mechanisms react the torque from the wire brake to the inflated portion of the boom. Through use of the CDM, the boom maintains a constant internal pressure during deployment to provide sufficient structural stiffness. The wire brake governs the internal pressure of the tube such that the boom provides the required force to deploy the sunshade plus any contingency load. Technical information detailing the development, design, analysis, and testing of the CDM are described in this paper.

Author
Deployment; ISIS Satellites; Spaceborne Experiments; Control Theory; Large Space Structures; Inflatable Space Structures; Space Erectable Structures

20000048404 Indian Space Research Organization, Satellite Centre, Bangalore, India
A Novel Mechanism Using Shape Memory Alloy to Drive Solar Flaps of the INSAT-2E Satellite
Viswanatha, N., Indian Space Research Organization, India; Murali, T. P., Indian Space Research Organization, India; 34th Aerospace Mechanisms Symposium; May 2000, pp. 239-249; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

An innovative drive mechanism developed by Indian Space Research Organization for deployment and positioning of solar flaps is successfully working on the geosynchronous multi-purpose communication satellite INSAT-2E. The drive mechanism works on linear actuators made of Shape Memory Alloy (SMA) wires and is capable of driving solar flaps in 2-degree steps, like a stepper motor. This paper describes the design of the mechanism, qualification testing and on-orbit experience.
Author
Linearity; Actuators; Shape Memory Alloys; Wire; Solar Arrays; Solar Energy Conversion; Flaps (Control Surfaces)

20000048405 Technical Research Centre of Finland, Automation Research Inst., Finland
Evolution of an Actuator Family
Stigell, Paul, Technical Research Centre of Finland, Finland; Kyrenius, Pekka, Technical Research Centre of Finland, Finland; Ylikorpi, Tomi, Technical Research Centre of Finland, Finland; Viherkanto, Kai, Technical Research Centre of Finland, Finland; 34th Aerospace Mechanisms Symposium; May 2000, pp. 251-263; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

VTT Automation got involved in spaceflight engineering in the mid-1980's and helped in the formation of the Finnish space industry. The first design was a worm gear mechanism that opened an auxiliary solar panel for the ASPERA instrument on board the Soviet Phobos spacecraft. Next came the Solar Wind ANisotropy (SWAN), including a 2-axis scanning mechanism, on board ESA's Solar and Heliospheric Observatory (SOHO). Two SWAN sensor units cover a field of view of nearly 4m VTT Automation developed scanning mechanisms for two instruments on board NASA's Cassini spacecraft, namely the ACT actuator for the CAPS instrument and the TT turntable for the MIMI/LEMMS instrument. The actuator concept was further developed in ESA's MPRA project. A version of ACT actuator is currently being manufactured for NASA's Two Wide Angle Imaging Neutral Atom Spectrometers (TWINS) mission.
Author
Actuators; Cassini Mission; Mariner Mark 2 Spacecraft; Phobos Spacecraft; Structural Design; Design Analysis

20000048408 Dornier Satellitensysteme G.m.b.H., Friedrichshafen, Germany
Antenna Pointing Mechanism for Steerable Spot Beam Antennas
Schmid, Manfred, Dornier Satellitensysteme G.m.b.H., Germany; 34th Aerospace Mechanisms Symposium; May 2000, pp. 287-301; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Antenna Pointing Mechanism (APM) was developed in the frame of a research and development program dedicated to geostationary Ka band communication antennas. At the end of the development phase, an APM qualification model was built and successfully tested. One of the main development goals was to establish a design not only accommodating the reference Ka band antenna, but fit for a range of potential applications and antenna configurations at low recurring costs. Figure 1 shows the Antenna Subsystem configuration that formed the basis for the APM development. This paper discusses the chosen technical approach and mechanism features on the basis of the established requirements as well as the issues encountered during the development and test phase.
Author
Antenna Design; Steerable Antennas; Beam Steering; Beams (Radiation); Microwave Antennas; Pointing Control Systems; Design Analysis

20000048410 Aerospace Corp., El Segundo, CA USA
Measurements of Friction Coefficients Between Oxidized and Contaminated Surfaces in Vacuum and in Air
Frantz, Peter, Aerospace Corp., USA; Didziulis, Stephen V., Aerospace Corp., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 317-330; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The successful operation of many moving mechanical assemblies is dependent upon controlling the coefficient of friction (COF) between sliding surfaces. However, the actual COF may deviate from expected values due to changes in surface composi-

tion during storage and testing. These effects are very important for low cycle devices that never establish a steady state operating condition. We have employed an ultra-high vacuum tribometer to measure the friction of common device materials in environmental conditions specific to space applications. The instrument provides for spectroscopic inspection of surface composition to correlate friction with surface chemistry. Extended tests were performed to determine the amount of cycles required to achieve steady state in the COF as oxides and contaminants were worn from the contacting surfaces.
Author
Coefficient of Friction; Sliding Friction

20000048412 NASA Kennedy Space Center, Cocoa Beach, FL USA
Design, Development, and Testing of Umbilical System Mechanisms for the X-33 Advanced Technology Demonstrator
Littlefield, Alan C., NASA Kennedy Space Center, USA; Melton, Gregory S., NASA Kennedy Space Center, USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 343-358; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The X-33 Advanced Technology Demonstrator is an un-piloted, vertical take-off, horizontal landing spacecraft. The purpose of the X-33 program is to demonstrate technologies that will dramatically lower the cost of access to space. The rocket-powered X-33 will reach an altitude of up to 100 km and speeds between Mach 13 and 15. Fifteen flight tests are planned, beginning in 2000. Some of the key technologies demonstrated will be the linear aerospike engine, improved thermal protection systems, composite fuel tanks and reduced operational timelines. The X-33 vehicle umbilical connections provide monitoring, power, cooling, purge, and fueling capability during horizontal processing and vertical launch operations. Two ”rise-off” umbilicals for the X-33 have been developed, tested, and installed. The X-33 umbilical systems mechanisms incorporate several unique design features to simplify horizontal operations and provide reliable disconnect during launch.
Author
X-33 Reusable Launch Vehicle; Recoverable Launch Vehicles; Unmanned Spacecraft; Flight Tests; Cost Reduction

20000048620 Air Force Research Lab., Materials and Manufacturing Directorate, Wright-Patterson AFB, OH USA
Endurance Pump Tests With Fresh and Purified MIL-PRF-83282 Hydraulic Fluid ***Final Report, 14 Dec. 1995-12 Sep. 1999***
Sharma, Shashi K.; Synder, Carl E., Jr.; Gschwender, Lois J.; Cecere, Gregory J.; Jenney, Timothy A.; Sep. 1999; 111p; In English; Prepared in cooperation with Dynamic Controls Inc., Dayton, OH.
Contract(s)/Grant(s): F33601-93-D-J006; AF Proj. 4347
Report No.(s): AD-A375877; AFRL-ML-WP-TR-1999-4185; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Recently the US Armed Forces began using portable external purifiers to clean used hydraulic fluid to permit its continued use in aircraft systems and to reduce the hydraulic fluid waste stream. Two endurance pump tests were conducted with F-16 aircraft hydraulic pumps, using both fresh and purified MIL-PRF-83282 hydraulic fluid, to determine if fluid purification had any adverse effect on pump life. The first test was conducted using fresh MIL-PRF-83282 hydraulic fluid. The second test was conducted with hydraulic fluid that was circulated for 75 minutes through a fluid purifier after every 300 hours of pump testing. The failure modes were similar for both the tests. In the first test, the barrel-bearing failed after 1343 hours whereas, in the second test, both the shaft-bearing and the barrel-bearing failed after 1513 hours. The difference in the bearing lives from the two tests is not significant. Rolling element bearings, made out of AISI 52100 steel, seem to be the weak link in the F-16 main hydraulic pump. The pump life may be considerably increased by the use of better bearing material such as M50 steel. There was no significant difference in pump performance. The fluid purification did not adversely affect the pump life.
DTIC
Pumps; Hydraulic Fluids; Performance Tests; Failure Modes; Hydraulic Equipment; Purification

20000048629 Department of the Navy, Washington, DC USA
Fluid Conduit
Henoch, Charles W., Inventor; Hendricks, Peter J., Inventor; Mar. 25, 1999; 10p; In English
Patent Info.: Filed 25 Mar. 1999; US-Patent-Appl-SN-09,285,182
Report No.(s): AD-D019628; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A fluid conduit for flowing electrically conductive fluids includes an electrically conductive pipe, an electrically conductive rod extending axially through the pipe and centrally thereof, a first power source in electrical communication with the pipe and rod, a solenoidal electromagnet disposed around the pipe and a second power source in electrical communication with the electro-

magnet. Activation of the first and second power sources creates an electric and a magnetic field, respectively, within the pipe which interact and result in a circumferential force in the flow with consequent reduction in wall friction in the pipe.
DTIC
Fluid Flow; Electric Current; Electricity; Electrical Resistivity

20000048633 Department of the Navy, Washington, DC USA
Leak Test Adapter System
Lewis, Keith B., Inventor; Dec. 07, 1999; 7p; In English; Supersedes US-Patent-Appl-SN-09140740, AD-D019039.
Patent Info.: Filed 27 Aug. 1998; US-Patent-Appl-SN-09,140,740; US-Patent-5,996,401
Report No.(s): AD-D019633; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A leak test adapter system and method for using same are provided for leak testing a container. a test port is defined in the container to have a cylindrical portion accessible from within the container and a slot accessible from the cylindrical portion and the exterior of the container. A housing fitted over the test port from the exterior of the container defines a chamber in line with the test port. A plug has a first portion scalable within the cylindrical portion of the test port, a second portion extending axially from the first portion for engagement in the slot when the first portion of the plug is sealed in the cylindrical portion, and a third portion extending axially from the second portion. A control rod is attachable to the third portion of the plug. The control rod forms a sealed fit with a portion of the chamber and is capable of movement along its longitudinal axis such that the first portion of the plug can be moved into the container to open the test port and into the cylindrical portion to seal the test port. A fluid passage is disposed in the housing in communication with the chamber between the container and the portion of the chamber forming a seal with the control rod. Fluid can pass through the fluid passage and the chamber about the control rod when moving to and from the test port.
DTIC
Leakage; Detection; Adapters; Patents

20000048635 Department of the Navy, Washington, DC USA
Multiline Tow Cable Assembly Including Swivel and Slip Ring
Williams, Michael R., Inventor; Nov. 16, 1999; 9p; In English; Supersedes US-Patent-Appl-SN-09137870
Patent Info.: Filed 12 Aug. 1998; US-Patent-Appl-SN-09,137,870; US-Patent-5,983,821
Report No.(s): AD-D019657; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A multiline tow cable assembly including swivel area components and slip ring components. The swivel area components include a rotor member connected to an external housing, at least one contact member formed within the rotor member and rotatable with the rotor, and first electrical leads connected to the at least one contact member. The slip ring components include a multiline termination member, a stator connected to the multiline termination member, at least one contact pin formed in connection with the stator, and second electrical leads connected to the at least one contact pin. A substantially friction free member is interposed between the swivel area components and the slip ring components for enabling relative rotation of the swivel area components with respect to the slip ring components. by the described assemblies, continuous electrical connection is maintained between the first and second electrical leads upon rotation of the swivel area components with respect to the slip ring components.
DTIC
Electric Wire; Power Lines; Cables (Ropes); Patents

20000050271 Department of the Navy, Washington, DC USA
Adjustable Electric Motor Bearing System
Cohen, Edward I., Inventor; Purnell, John G., Inventor; Dec. 14, 1999; 4p; In English; Supersedes US-Patent-Appl-SN-08988037, AD-D019440.
Patent Info.: Filed 10 Dec. 1997; US-Patent-Appl-SN-08,988,037; US-Patent-6,000,851
Report No.(s): AD-D019640; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The parameters of a rotor bearing assembly are readily changed to facilitate evaluation, determination and establishment of optimum hearing clearance and rotor bearing adjustment to minimize noise and vibration, by an arrangement which includes seating of solid deflection pads positioned within a carrier on replaceable adjustment shims and retention of the pads and shims seated in adjusted positions by means of hold-down screws.
DTIC
Electric Motors; Stators; Rotors; Bearings; Patents

20000052446 Oregon State Univ., Corvallis, OR USA

Design, Fabrication, and Testing of a Portable Suction Pump ***Final Report, 15 Mar. 1999-14 Mar. 2000***

Costello, Mark F.; Apr. 2000; 80p; In English

Contract(s)/Grant(s): DAMD17-99-2-9020

Report No.(s): AD-A375291; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The objective of this project was to design and develop a lightweight, compact, effective, and easily operated medical suction pump for the Walter Reed Army Institute of Research. Current battlefield suction pumps are substandard in their performance; these commercially available, hand-powered suction pumps are large and have low durability, making them unsuitable for use in the field. Using initial design requirements provided by the military, research was performed to determine the best concepts for the application. Two of these concepts were developed first into product designs, then into working prototypes. These prototypes were evaluated against off-the-shelf suction pumps using the provided design guidelines. It was found that the prototypes outperformed the commercial pumps in weight, size, and suction.

DTIC

Fabrication; Research and Development; Medical Equipment; Suction; Pumps

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QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, inspection, maintainability, and standardization.

20000046613 Tovarna Sladkorja, Slovenia

Fault Detection in Dynamic Systems and Their Diagnostics ***Prepoznavanje Napak v Dinamicnih Sistemih in Njihova Diagnostika***

Zadravec, Boris, Tovarna Sladkorja, Slovenia; Tovornik, Boris, Maribor Univ., Slovenia; Vukic, Zoran, Zagrebu Univ., Croatia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 1, pp. 35-40; In Slovak; Copyright; Avail: Issuing Activity

In the real world, there are many factors forcing us to detect and apply predict deviations from the desired process states. Technical-technological dynamic processes apply a lot of measuring devices informing us about the states of the measured processes. They also act as indicators about deviations or unpermissive states of processes. to avoid deviations and thereby provide the desired stability of processes, our methods for error detection have to be used. The following article is presenting the analysis and purpose of the error recognition, advantages of the SMART devices and their incorporation in the SCADA systems. It also presents the technological process of the steam boiler. At the end, the example (simulation) of water leveling for the supplying drum of steam boiler is given. The same example is also including the described error recognition method. Analysis of the errors that caused the malfunction of steam boiler showed us that in the 38% of all cases the cause of error was unrecognized. In the other 20% of all cases, the malfunction or error was generated by the malfunction of the electric devices. Next 20% of errors were caused by the power supply, 14% of all were caused by technological errors, 5% due to human factor and finally, 3% of errors were caused by machinery Surprisingly high is the percentage (38%), of the unknown errors, i.e. errors that can not be recognized during the process. Therefore the goal is to provide the preemptive, accurate, fast and reliable method of error detection that will result in more rational and safer running of the technological process. SMART (Self Monitoring Analysis and Repeating Technology) devices have several advantages against usual devices. In addition to signal measuring, SMART devices can be remotely parameterized, supervised and controlled during their operation (state and error signaling). The SMART devices are connected to the controlling system or systems by industrial Signal buses. The steam boiler process is containing the seven regulation circuits and one of them, the water leveling regulator, is shown. Regulator LICA+/-203 is maintaining the desired water level in drum, which is changing relative to the current steam flow. For process modeling the SIMULINK program was used. The model contains the process model, SCADA (Supervisory Control and Data Acquisition Systems) database model which is containing the status of the controllers, BUS interfaces, SMART device models, recognition system model (confluence validity) and error diagnostic model (error decision tree). The example of frozen valve V222 error by using one of the fulfilled confluence and the decision tree is shown. Results presented are showing that the error recognition method by using the confluence is slower than recognition of errors based on the information from the process (information presented by SMART devices, controllers and BUS interfaces). Therefore we can conclude, that using the SMART devices and other information from the process that are contained within SCADA system, more than enough options are provided for building the simple, transparent, robust and valuable system for error recognition and diagnosing.

Author

Fault Detection; Error Analysis; Dynamical Systems; Data Acquisition; Data Bases

20000047448 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

MEMS Reliability Assurance Guidelines for Space Applications

Stark, Brian, Editor, Jet Propulsion Lab., California Inst. of Tech., USA; January 1999; 312p; In English

Contract(s)/Grant(s): NAS7-1407

Report No.(s): JPL-Publ-99-1; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

This guide is a reference for understanding the various aspects of microelectromechanical systems, or MEMS, with an emphasis on device reliability. Material properties, failure mechanisms, processing techniques, device structures, and packaging techniques common to MEMS are addressed in detail. Design and qualification methodologies provide the reader with the means to develop suitable qualification plans for the insertion of MEMS into the space environment.

Author

Microelectromechanical Systems; Technology Utilization; Structural Reliability; Component Reliability

20000048385 Planetary Systems Corp., Washington, DC USA

Misconceptions in Mechanism Reliability

Holemans, Walter, Planetary Systems Corp., USA; Gibbons, Donald, Lockheed Martin Space Systems Co., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 51-60; In English; See also 20000048380; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Spacecraft mechanisms are in practice less reliable than intended. Today's designs are increasingly designed in shorter times with increasing reliance on historical design data. As spacecraft mechanism designs are is reused in different applications and modified by engineers removed from the initial mechanism design there is increasingly more opportunity to introduce new failure modes. Several misconceptions in mechanism reliability are presented. Examples demonstrating misconceptions are provided and discussed. The misconceptions presented are: (1) reliability of a mechanism can be calculated from the reliabilities of the mechanism's components; (2) increasing force will increase reliability; (3) the more expensive and difficult the test, the less necessary it is to execute; (4) adding a back-up component will necessarily increase reliability; (5) successfully operating a mechanism once indicates high reliability.

Author

Spacecraft Reliability; Component Reliability; Spacecraft Maintenance

20000050244 Osaka Univ., Faculty of Engineering, Osaka, Japan

Development of Surface State Evaluation Method by High Precision Photo-Reflectance Spectrum Measurement

Inagaki, Kouji, Osaka Univ., Japan; Fujimoto, Yoshitaka, Osaka Univ., Japan; Sugiyama, Kazuhisa, Osaka Univ., Japan; Endo, Katsuyoshi, Osaka Univ., Japan; Yamauchi, Kazuto, Osaka Univ., Japan; Hirose, Kikuji, Osaka Univ., Japan; Mori, Yuzo, Osaka Univ., Japan; Technology Reports of the Osaka University; Apr. 15, 2000; ISSN 0030-6177; Volume 50, No. 2372, pp. 49-54; In English; Copyright; Avail: Issuing Activity

In order to develop differential photo-reflectance spectrum method aiming for non-destructive evaluation of industrial Si wafer surfaces, such as ultra-precision machined surfaces or those with oxide layer, we attempted to elucidate experimentally obtained dependency of reflectance on the surface orientation through theoretical analysis. Spectrum structure can be qualitatively understood by the comparison of calculated joint density of states and experimental spectrum data.

Author

Procedures; Nondestructive Tests; Photorefractivity; Silicon; Surface Finishing

20000051486 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands

Optimization of the Pulsed Eddy-Current Technique for Non-Intrusive Inspection of Corrosion under Insulation

Morsink, B. J., Technische Univ., Netherlands; Jul. 1997; 136p; In English

Report No.(s): PB2000-103689; ET/EM-1997-14; Copyright; Avail: National Technical Information Service (NTIS)

Maintenance costs in the chemical and petroleum industry can be reduced by adequate non-intrusive testing methods. One of the major problems is corrosion under insulation. The most promising technique for dealing with this problem is the pulsed eddy-current technique. This method entails both the induction of eddy-currents in a conductive test object caused by a transmitter coil and the consecutive induction of a voltage in the receiver coil. The authors focus on optimizing the transmitter-receiver configuration by studying the induced electromagnetic field distribution and by performing a sensitivity analysis. The authors assume the configuration to be a planary layered system with a defect located in it. The authors derive the field representations for the direct source and the scattering problem, the latter formulated in terms of a domain-integral equation. The relevant Green's functions are derived for a three-layer system and are formulated in terms of a two-dimensional Fourier transform. The numerical

implementation for the direct source problem is done by using the fast Fourier transform. It resulted into two computer programs for calculating the electromagnetic field distribution and for calculating the sensitivity of the receiver coil.
NTIS
Corrosion; Insulation; Optimization; Procedures; Nonintrusive Measurement; Maintenance; Computer Programs; Eddy Currents

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STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

20000046567 Oak Ridge National Lab., TN USA
Practical Test Method for Mode I Fracture Toughness of Adhesive Joints with Dissimilar Substrates
Boeman, R. G.; Erdman, D. L.; Klett, L. B.; Lomax, R. D.; Sep. 27, 1999; 9p; In English; SAMPE-ACCE-DOE Advanced Composites Conference, 27-28 Sep. 1999, Detroit, MI, USA
Report No.(s): DE00-009731; ORNL/CP-104246; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A practical test method for determining the mode I fracture toughness of adhesive joints with dissimilar substrates will be discussed. The test method is based on the familiar Double Cantilever Beam (DCB) specimen geometry, but overcomes limitations in existing techniques that preclude their use when testing joints with dissimilar substrates. The test method is applicable to adhesive joints where the two bonded substrates have different flexural rigidities due to geometric and/or material considerations. Two specific features discussed are the use of backing beams to prevent substrate damage and a compliance matching scheme to achieve symmetric loading conditions. The procedure is demonstrated on a modified DCB specimen comprised of SRIM composite and thin-section, e-coat steel substrates bonded with an epoxy adhesive. Results indicate that the test method provides a practical means of characterizing the mode I fracture toughness of joints with dissimilar substrates.
NTIS
Adhesives; Performance Tests; Fracture Strength; Joints (Junctions); Damage; Adhesive Bonding

20000048406 TRW, Inc., Space and Technology Div., Redondo Beach, CA USA
Coaxial Cable Failure in a Spacecraft Mechanism
Chiu, Michael, TRW, Inc., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 265-274; In English; See also 20000048380; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

After completing a life test, the Biaxial Assembly's (BA) coaxial cables failed their post-life RF performance testing. Further investigation into the cause of these failures revealed that the coaxial cables developed extensive damage to their outer shields, which resulted in unacceptable RF performance. This damage was caused by a phenomenon known as "cold welding", a type of adhesion between two similar material fretting surfaces that restricted the internal flexing of the cable. This paper will summarize the testing environment to which the BA was exposed and describe the results of our investigation into the failures. Also, methods of preventing cold welding will be described, as well as lessons learned for coaxial cable construction and life testing of spacecraft mechanisms.
Author
Coaxial Cables; Damage; Failure

20000048807 Technische Hogeschool, Dept. of Aerospace Engineering, Delft, Netherlands
Cable Mechanics and Computation in B2000
Smith, P. S., Technische Hogeschool, Netherlands; Jan. 1999; 190p; In English
Report No.(s): PB2000-103719; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

In this report a cable element will be discussed that has been implemented into the finite element code B2000. This element has only axial stiffness and can be used as a first approximation to the simulation of static as well as transient cable behavior. A special difficulty with the simulation of this behavior is that in the absence of tension, the equilibrium configuration of a cable is undefined. This peculiar characteristic is due to the absence of bending stiffness and it poses an obstacle in the static analysis of structures where cables are used. This fundamental property, the degeneration of the stiffness of the structure as soon as cables become tensionless, requires special approaches to the solution of cable structures. Therefore, it is especially this problem that

will be discussed in this report. The developed cable element can be used for quasi-static analysis and linearized vibration analysis around stable states, but also for transient analysis. Some applications of the cable element will be presented.
NTIS
Computation; Simulation; Dynamic Structural Analysis; Degeneration; Cables (Ropes)

20000050241 NASA Langley Research Center, Hampton, VA USA
Transverse Stress Decay in a Specially Orthotropic Strip Under Localizing Normal Edge Loading
Fichter, W. B., NASA Langley Research Center, USA; Mechanics of Composite Materials and Structures; 2000; ISSN 1075-9417; Volume 7, pp. 153-175; In English; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Solutions are presented for the stresses in a specially orthotropic infinite strip which is subjected to localized uniform normal loading on one edge while the other edge is either restrained against normal displacement only, or completely fixed. The solutions are used to investigate the diffusion of load into the strip and in particular the decay of normal stress across the width of the strip. For orthotropic strips representative of a broad range of balanced and symmetric angle-ply composite laminates, minimum strip widths are found that ensure at least 90% decay of the normal stress across the strip. In addition, in a few cases where, on the fixed edge the peak shear stress exceeds the normal stress in magnitude, minimum strip widths that ensure 90% decay of both stresses are found. to help in putting these results into perspective, and to illustrate the influence of material properties on load 9 orthotropic materials, closed-form solutions for the stresses in similarly loaded orthotropic half-planes are obtained. These solutions are used to generate illustrative stress contour plots for several representative laminates. Among the laminates, those composed of intermediate-angle plies, i.e., from about 30 degrees to 60 degrees, exhibit marked changes in normal stress contour shape with stress level. The stress contours are also used to find 90% decay distances in the half-planes. In all cases, the minimum strip widths for 90% decay of the normal stress exceed the 90% decay distances in the corresponding half-planes, in amounts ranging from only a few percent to about 50% of the half-plane decay distances. The 90% decay distances depend on both material properties and the boundary conditions on the supported edge.
Author
Orthotropism; Edge Loading; Laminates; Mechanical Properties; Stresses; Transverse Loads

20000050242 Case Western Reserve Univ., Dept. of Materials Science and Engineering, Cleveland, OH USA
Elastic Moduli of Pyrolytic Boron Nitride Measured Using 3-Point Bending and Ultrasonic Testing
Kaforey, M. L., Case Western Reserve Univ., USA; Deeb, C. W., Case Western Reserve Univ., USA; Matthiesen, D. H., Case Western Reserve Univ., USA; Roth, D. J., NASA Glenn Research Center, USA; [1999]; 18p; In English
Contract(s)/Grant(s): NAG8-1268; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Three-point bending and ultrasonic testing were performed on a flat plate of PBN. In the bending experiment, the deformation mechanism was believed to be shear between the pyrolytic layers, which yielded a shear modulus, c (sub 44), of 2.60 plus or minus .31 GPa. Calculations based on the longitudinal and shear wave velocity measurements yielded values of 0.341 plus or minus 0.006 for Poisson's ratio, 10.34 plus or minus .30 GPa for the elastic modulus (c (sub 33)), and 3.85 plus or minus 0.02 GPa for the shear modulus (c (sub 44)). Since free basal dislocations have been reported to affect the value of c (sub 44) found using ultrasonic methods, the value from the bending experiment was assumed to be the more accurate value.
Author
Boron Nitrides; Modulus of Elasticity; Ultrasonic Tests; Pyrolytic Materials; Bend Tests

20000050243 Case Western Reserve Univ., Dept. of Materials Science and Engineering, Cleveland, OH USA
Effective Elastic Modulus as a Function of Angular Leaf Span for Curved Leaves of Pyrolytic Boron Nitride
Kaforey, M. L., Case Western Reserve Univ., USA; Deeb, C. W., Case Western Reserve Univ., USA; Matthiesen, D. H., Case Western Reserve Univ., USA; [1999]; 20p; In English
Contract(s)/Grant(s): NAG8-1268; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A theoretical equation was derived to predict the spring constant (load/deflection) for a simply supported cylindrical section with a line force applied at the center. Curved leaves of PBN were mechanically deformed and the force versus deflection data was recorded and compared to the derived theoretical equation to yield an effective modulus for each leaf. The effective modulus was found to vary from the pure shear modulus for a flat plate to a mixed mode for a half cylinder as a function of the sine of one half the angular leaf span. The spring constants of individual PBN leaves were usually predicted to within 30%.
Author
Boron Nitrides; Modulus of Elasticity; Loads (Forces); Pyrolytic Materials; Deflection

20000050368 NASA Langley Research Center, Hampton, VA USA

Stress Recovery and Error Estimation for Shell Structures

Yazdani, A. A., Hawaii Univ., USA; Riggs, H. R., Hawaii Univ., USA; Tessler, A., NASA Langley Research Center, USA; International Journal for Numerical Methods in Engineering; 2000; Volume 47, pp. 1825-1840; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG1-1850; Copyright; Avail: Issuing Activity

The Penalized Discrete Least-Squares (PDLS) stress recovery (smoothing) technique developed for two dimensional linear elliptic problems is adapted here to three-dimensional shell structures. The surfaces are restricted to those which have a 2-D parametric representation, or which can be built-up of such surfaces. The proposed strategy involves mapping the finite element results to the 2-D parametric space which describes the geometry, and smoothing is carried out in the parametric space using the PDLS-based Smoothing Element Analysis (SEA). Numerical results for two well-known shell problems are presented to illustrate the performance of SEA/PDLS for these problems. The recovered stresses are used in the Zienkiewicz-Zhu a posteriori error estimator. The estimated errors are used to demonstrate the performance of SEA-recovered stresses in automated adaptive mesh refinement of shell structures. The numerical results are encouraging. Further testing involving more complex, practical structures is necessary.

Derived from text

Error Analysis; Estimating; Finite Element Method; Stress Analysis; Shells (Structural Forms); Structural Analysis

20000050474 Case Western Reserve Univ., Dept. of Materials Science and Engineering, Cleveland, OH USA

Spring Constants for Stacks of Curved Leaves of Pyrolytic Boron Nitride

Kaforey, M. L., Case Western Reserve Univ., USA; Deeb, C. W., Case Western Reserve Univ., USA; Matthiesen, D. H., Case Western Reserve Univ., USA; [1999]; 20p; In English

Contract(s)/Grant(s): NAG8-1268; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Stacks of curved leaves of pyrolytic boron nitride (PBN) were deflected and the force versus deflection data was recorded. From this data, the spring constant for a given spring geometry (radius of curvature of a leaf, width of a leaf, thickness of a leaf, and number of leaves in the stack) was determined. These experiments were performed at room temperature, 500 C and 1000 C. However, temperature was not found to affect the spring constant. The measured values were generally within one order of magnitude of predictions made using a previously derived equation for a simply supported cylindrical section with a line force at the center.

Author

Boron Nitrides; Stacks; Curvature; Deflection

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GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see categories 41 through 48.

20000045200 NASA, Washington, DC USA

NASA's Upper Atmosphere Research Program (UARP) and Atmospheric Chemistry Modeling and Analysis Program (ACMAP): Research Summaries 1997-1999

Kurylo, M. J., NASA, USA; DeCola, P. L., NASA, USA; Kaye, J. A., NASA, USA; March 2000; 574p; In English

Report No.(s): NASA/TP-2000-210016/PT1; NAS 1.60:210016/PT1; No Copyright; Avail: CASI; A24, Hardcopy; A04, Microfiche

Under the mandate contained in the FY 1976 NASA Authorization Act, the National Aeronautics and Space Administration (NASA) has developed and is implementing a comprehensive program of research, technology development, and monitoring of the Earth's upper atmosphere, with emphasis on the upper troposphere and stratosphere. This program aims at expanding our chemical and physical understanding to permit both the quantitative analysis of current perturbations as well as the assessment of possible future changes in this important region of our environment. It is carried out jointly by the Upper Atmosphere Research Program (UARP) and the Atmospheric Chemistry Modeling and Analysis Program (ACMAP), both managed within the Research Division in the Office of Earth Science at NASA. Significant contributions to this effort have also been provided by the Atmospheric Effects of Aviation Project (AEAP) of NASA's Office of Aero-Space Technology. The long-term objectives of the present program are to perform research to: understand the physics, chemistry, and transport processes of the upper troposphere and the stratosphere and their control on the distribution of atmospheric chemical species such as ozone; assess possible perturbations to

the composition of the atmosphere caused by human activities and natural phenomena (with a specific emphasis on trace gas geographical distributions, sources, and sinks and the role of trace gases in defining the chemical composition of the upper atmosphere); understand the processes affecting the distributions of radiatively active species in the atmosphere, and the importance of chemical-radiative-dynamical feedbacks on the meteorology and climatology of the stratosphere and troposphere; and understand ozone production, loss, and recovery in an atmosphere with increasing abundances of greenhouse gases. The current report is composed of two parts. Part 1 summarizes the objectives, status, and accomplishments of the research tasks supported under NASA UARP and ACMAP in a document entitled, Research Summaries 1997- 1999. Part 2 is entitled Present State of Knowledge of the Upper Atmosphere 1999 An Assessment Report.
Derived from text
Congressional Reports; Research; Technology Assessment; Upper Atmosphere; Meteorology; Greenhouse Effect; Earth Atmosphere; Chemical Composition; Atmospheric Composition; Atmospheric Chemistry

20000047263 Research and Technology Organization, Studies, Analysis and Simulation Panel, Neuilly-sur-Seine, France
Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases ***Approches de l'application des techniques de prevention de la pollution sur les bases militaires***
Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000; 343p; In English; Symposium of the RTO Studies, Analysis and Simulation Panel: Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases, 5-7 May 1999, Budapest, Hungary; See also 20000047264 through 20000047289; CD ROM: CD ROM contains the entire document presented in PDF format
Report No.(s): RTO-MP-39; AC/323(SAS)TP/14; ISBN 92-837-1025-8; Copyright Waived; Avail: CASI; C01, CD-ROM; A15, Hardcopy; A03, Microfiche

Military operations within the framework of Environment Security are largely dependent on conformance with national and international laws or agreements to protect the air, water and ground resources. Pollution must be controlled, modified, or eliminated at the source. Society is paying a very high price today to restore and reclaim resources that have been subject to wanton pollution for many years by both military and civilian users. Many NATO and Partnership for Peace operations and training exercises are now being constrained by national and international environmental laws. Military forces, air, land and sea, must be enabled to operate and train under a wide variety of conditions. Serious consideration must be given to compliance with the body of environmental law either in existence or now being written. Pollution Prevention activities will ensure the ability to continue operation without undue penalty or restriction.
Author
Environment Pollution; Environment Protection; Military Operations; Pollution Control

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see 35 Instrumentation and Photography.

20000045169 National Research Inst. for Earth Science and Disaster Prevention, Shinjo Branch of Snow and Ice Studies, Tsukuba, Japan
Observation and Analysis on the Process of the Atmosphere-Ocean-Land Interactions, 3, Observation and Analysis on the Process Over the Land
Sato, Takeshi, National Research Inst. for Earth Science and Disaster Prevention, Japan; Society of Instrument and Control Engineers; 1996; ISSN 000-0121, pp. 236-288; In Japanese; Copyright Waived; Avail: CASI; A04, Hardcopy; A01, Microfiche

Snow cover and frozen ground in the Tibetan Plateau have great influence not only on the Asian Monsoon activity but also on the global climate system. In order to understand the mechanism of the Asian Monsoon, seasonal and inter-annual variations of snow cover and frozen ground should be clarified and the quantitative relationship between them and the Asian Monsoon activity should be studied. In this study, automatic observations of snow cover and frozen ground have been carried out since 1993 summer at three sites (Lhasa, Rikeze and Nagqu) in the Tibetan Plateau, as the cooperative study with China Meteorological Administration.
Derived from text
Air Water Interactions; Annual Variations; Climatology; Snow Cover; Permafrost

20000046792 Woods Hole Oceanographic Inst., MA USA

Sound Propagation from the Continental Slope to the Continental Shelf: Remote Sensing Component ***Final Report, 15 Mar. 1995-31 Dec. 1997***

Kelly, Kathryn A.; Caruso, Michael J.; Mar. 22, 2000; 6p; In English

Contract(s)/Grant(s): N00014-95-1-0575

Report No.(s): AD-A375942; WHOI-1300575-00; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Satellite altimetry and AVHRR images were used in conjunction with in-situ measurements to understand the geometry and seasonality of the shelf/slope front and the fluctuations of the slope water along the East Coast of North America. The AVHRR images were used to show the location and orientation of the shelf/slope front and the altimeter was used to study the fluctuations of the geostrophic currents. The imagery was used in near real time during at-sea intensive observation periods to provide a context for the surveys and acoustic work. The altimeter data was also used to study the larger-scale and longer time period variations in sea surface height (SSH) and geostrophic currents.

DTIC

Continental Shelves; Remote Sensing; Sound Propagation; Satellite Imagery; Slopes

20000047288 Industrieanlagen-Betriebsgesellschaft m.b.H., Div. for Environment and Management Systems, Ottobrunn, Germany

Airborne Sensor Survey for the Detection of Hazardous Substances and Objects in the Subsurface

Klemm, Horst G., Industrieanlagen-Betriebsgesellschaft m.b.H., Germany; Schafer, Joerg, Industrieanlagen-Betriebsgesellschaft m.b.H., Germany; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 30-1 - 30-8; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

In recent years there has been a surge of interest in methods for a rapid and reliable detection of unexploded ordnance (UXO) and other hazardous substances and objects in the subsurface. In Germany much of the motivation comes from recent environmental protection projects for the investigation and clean up of former military and industrial sites. The tremendous size of these areas to be investigated made it necessary to find innovative methods to get a rapid view of the contaminations for upcoming planning tasks and also to minimize the costs for necessary ground based surveys and clean up. Having been the prime contractor for a large project for the investigation of the contamination of more than 1000 former military sites of the West Group of the Russian Troops (WGT) in Eastern Germany the IABG gained an valuable amount of information and knowledge about the problems of the clean up of hazardous waste on military sites. As a result IABG started a research and development project using airborne sensor systems for the survey and detection of hazardous substances and UXO in 1997.

Author

Hazardous Materials; Ordnance; Environment Protection; Remote Sensing; Airborne Radar

20000048397 NASA Ames Research Center, Moffett Field, CA USA

The Sandmeier Field Goniometer: A Measurement Tool for Bi-Directional Reflectance

Turner, Mark, NASA Ames Research Center, USA; Brown, Jeff, NASA Ames Research Center, USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 167-174; In English; See also 20000048380; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Recent activities at the Remote Sensing Program at Stennis Space Center have identified the need to properly verify and validate data provided by the remote sensing community. One important variable, which effects remote sensing data is bi-directional reflectance distribution (BRDF). In order to quantify the effects of BRDF on man-made and natural ground targets, the Stennis Verification & Validation (V&V) team commissioned the Systems Engineering Division at NASA Ames Research Center to develop a Field Goniometer for use at the V&V Large Target Range and for various ground truthing missions. The Swiss Field Goniometer (FIGOS) was used as a benchmark instrument to design the new state of the art Sandmeier Field Goniometer (SGF), named after Stefan Sandmeier, developer of FIGOS. After establishing requirements for the SFG, design efforts began in early May 1998. The design of the SFG was completed in September 1998. Manufacturing, construction, and testing was completed in May 1999. The SFG was shipped to NASA SSC and fully operational by June 1999.

Author

Goniometers; Optical Measuring Instruments; Bidirectional Reflectance; Remote Sensing

20000052261 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Comparisons of Digital Terrain Data for Wetland Inventory on Two Alaskan Army Bases

Melloh, Rae A.; Racine, Charles C.; Sprecher, StevenW.; Greeley, Nancy H.; Weyrick, Patricia B.; Nov. 1999; 28p; In English

Report No.(s): AD-A375317; CRREL-SR-99-15; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The nation's military installations encompass undeveloped lands that have become increasingly important as wildlife habitats. Resource managers of the installations need wetland inventories to improve stewardship of these lands. Digital geographic data are readily available to land managers. The use of these data to inventory wetlands has not been demonstrated. As part of a project to integrate wetlands into the ITAM (Integrated Training Area Management) program for managing Army lands, wetland inventory methods using existing digital geographic information for two terrains on Army installations in Alaska were explored: (I) glacial moraine depressions and estuarine marsh on Fort Richardson, and (2) discontinuous permafrost and taiga forest on Fort Wainwright's Yukon Command training site. Our results show that (1) existing geographic data used to infer wetland locations (LANDSAT Thematic Mapper TM. National Wetland Inventory NWI maps. and hygric soil maps) only partly agree. and (2) optimum LANDSAT TM band combinations for wetland inventory vary on a site-specific basis. LANDSAT TM classifications (unsupervised) of Fort Richardson wetlands compared reasonably well (0.73 Kappa Index of Agreement KIA) with the NWI map as long as the band combinations included at least one visible and the near-infrared wavelength band (e.g.. bands 3, 4, and 5 or bands 2, 3, and 4). The Fort Richardson hygric soils map indicates more extensive wetlands than indicated by the NWI (0.64 KIA). The LANDSAT TM classification could be made to agree fairly.
DTIC
Digital Data; Terrain Analysis; Soil Mapping; Alaska; Wetlands

20000052500 Computer Sciences Corp., Hampton, VA USA
Identification of Terrestrial Reflectance From Remote Sensing
Alter-Gartenberg, Rachel, Computer Sciences Corp., USA; Nolf, Scott R., Computer Sciences Corp., USA; May 2000; 80p; In English
Contract(s)/Grant(s): NAS1-20431; RTOP 258-70-21-16
Report No.(s): NASA/CR-2000-210116; NAS 1.26:210116; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Correcting for atmospheric effects is an essential part of surface-reflectance recovery from radiance measurements. Model-based atmospheric correction techniques enable an accurate identification and classification of terrestrial reflectances from multispectral imagery. Successful and efficient removal of atmospheric effects from remote-sensing data is a key factor in the success of Earth observation missions. This report assesses the performance, robustness and sensitivity of two atmospheric-correction and reflectance-recovery techniques as part of an end-to-end simulation of hyper-spectral acquisition, identification and classification.
Author
Atmospheric Correction; Earth Observations (From Space); Remote Sensing; Imagery; Atmospheric Effects; Spectral Reflectance

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ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

20000045699 Auburn Univ., AL USA
Terrestrial Energy Storage SPS Systems ***Final Report, 15 Sep. - 31 Dec. 1998***
Brandhorst, Henry W., Jr., Auburn Univ., USA; [1998]; 13p; In English; Workshop on Terrestrial Energy Storage and Ground Systems for Space Solar Power Systems, Auburn, AL, USA
Contract(s)/Grant(s): NAG8-1563; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Terrestrial energy storage systems for the SSP system were evaluated that could maintain the 1.2 GW power level during periods of brief outages from the solar powered satellite (SPS). Short-term outages of ten minutes and long-term outages up to four hours have been identified as "typical" cases where the ground-based energy storage system would be required to supply power to the grid. These brief interruptions in transmission could result from performing maintenance on the solar power satellite or from safety considerations necessitating the power beam be turned off. For example, one situation would be to allow for the safe passage of airplanes through the space occupied by the beam. Under these conditions, the energy storage system needs to be capable of storing 200 MW-hrs and 4.8 GW-hrs, respectively. The types of energy storage systems to be considered include compressed air energy storage, inertial energy storage, electrochemical energy storage, superconducting magnetic energy storage, and pumped hydro energy storage. For each of these technologies, the state-of-the-art in terms of energy and power densities were

identified as well as the potential for scaling to the size systems required by the SSP system. Other issues addressed included the performance, life expectancy, cost, and necessary infrastructure and site locations for the various storage technologies.
Derived from text
Conferences; Electric Energy Storage; Electrochemical Cells; Magnetic Energy Storage

20000046566 National Renewable Energy Lab., Golden, CO USA
SuperShuttle CNG Fleet Start-Up Experience
Eudy, Leslie; May 18, 1999; 6p; In English
Report No.(s): DE00-009810; NREL/FS-540-26439; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Gas Research Institute (GRI) and the U.S. Department of Energy (DOE), along with several industry partners, are collaborating with SuperShuttle of Denver, Colorado, to evaluate natural gas vans added to the SuperShuttle fleet in 1999. Brand new (1999 model year) dedicated and bi-fuel compressed natural gas (CNG) vans manufactured by Ford Motor Company will be operated side-by-side with several similar gasoline vehicles in normal revenue service. Once the study is complete, DOE's National Renewable Energy Laboratory will analyze and compile the results for release.
NTIS
Natural Gas; Research; Compressed Gas; Trucks

20000046572 Federal Energy Technology Center, Morgantown, WV USA
Partial Oxidation Technique for Fuel-Cell Anode Exhaust-Gas Synthesis
Robey, Edward H.; Gemmen, Randall S.; Nov. 10, 1998; 34p; In English
Report No.(s): DE00-001658; DOE/FETC-98/1071; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This paper describes the performance of a gas generator used to synthesize the exhaust gas from the anode of a molten-carbonate fuel cell. The composition of this gas is estimated to be that of equilibrium at 1,250 ° F and 1 atm: 48% CO<sub& gt;2</sub> , 39% H<sub& gt;2</sub>O, 5% CO, and 8% H< sub>2</sub>, with an energy content of approximately 39 Btu/scf (higher heating value). to synthesize a range of gas compositions around this point, the gas generator partially oxidizes a mixture of CH<sub& gt;4</sub> , O< sub>2</sub> , and CO₂ to generate energy densities between 20 and 60 Btu/scf at temperatures between 1,198 and 1,350 ° F. Results show that the technique provides a relatively high ratio of CO to H2 concentrations compared with the target composition (CO:H₂ of 2, versus 0.71). A detailed chemical model shows that the likely cause is quenching of the CO and H₂ chemistry below 2,000 ° F.
NTIS
Gas Generators; Procedures; Oxidation; Gas Composition

20000048401 NASA Goddard Space Flight Center, Greenbelt, MD USA
LANDSAT 7 Solar Array Testing Experiences
Helfrich, Daniel, NASA Goddard Space Flight Center, USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 213-223; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper covers the extensive LANDSAT 7 solar array flight qualification testing effort. Details of the mechanical design of the solar array and its retention/release system are presented. A testing chronology is provided beginning with the onset of problems encountered at the subsystem level and carrying through the third and final powered-spacecraft ground deployment test. Design fixes and other changes are explained in the same order as they became necessary to flight-qualify the array. Some interesting lessons learned are included along with key references.
Author
LANDSAT 7; Solar Arrays

20000048402 Mechanical Dynamics, Inc., Austin, TX USA
Deployment Dynamics of Solar Arrays with a Link-In-Slot Hinge/Latch Mechanism
Daniel, Walter K., Mechanical Dynamics, Inc., USA; Bidinger, G. Michael, Orbital Sciences Corp., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 225-230; In English; See also 20000048380; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

A solar array mechanism with both hinge and latch characteristics has been designed, developed, tested, and flown in orbit. Dynamics analysis of this link-in-slot device showed that no over-deployment took place when the dynamic coefficient of friction was higher than 0.4. The mechanism design has been verified in ground-based deployment tests and proven in flight.
Author
Solar Arrays; Design Analysis; Dynamic Tests

20000048413 SatCon Technology Corp., Peoria, AZ USA
Development of a Flywheel for Energy Storage and Attitude Control of an Exoatmospheric Interceptor
Havenhill, Doug, SatCon Technology Corp., USA; Nimblett, Frank, SatCon Technology Corp., USA; Nichols, Steve, SatCon Technology Corp., USA; Young, John, SatCon Technology Corp., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 359-372; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

SatCon Technology Corporation is developing a unique subsystem that controls the attitude and trajectory of an exoatmospheric kinetic weapon (KW) while supplying power to the weapon's subsystems. The Missile Integrated Power and Roll Control System (MIPARS) uses SatCon-developed flywheels and control electronics in conjunction with a multiple ignition solid fuel gas generator to provide rotational and translational control of the KW. Energy stored in the rotating flywheels is used to supply power to the KW throughout its flight.
Author
Weapon Systems; Weapons Development; Missile Design; Flywheels; Energy Storage; Attitude Control; Missile Control; Lateral Control

20000048812 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Results of the 1999 JPL Balloon Flight Solar Cell Calibration Program
Anspaugh, B. E., Jet Propulsion Lab., California Inst. of Tech., USA; Mueller, R. L., Jet Propulsion Lab., California Inst. of Tech., USA; Weiss, R. S., Jet Propulsion Lab., California Inst. of Tech., USA; Mar. 01, 2000; 36p; In English
Report No.(s): JPL-Publ-00-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The 1999 solar cell calibration balloon flight campaign consisted of two flights, which occurred on June 14, 1999, and July 6, 1999. All objectives of the flight program were met. Fifty-seven modules were carried to an altitude of approximately equal to 120,000 ft (36.6 km). Full I-V curves were measured on five of these modules, and output at a fixed load was measured on forty-three modules (forty-five cells), with some modules repeated on the second flight. This data was corrected to 28 C and to 1 AU (1.496 x 10 (exp 8) km). The calibrated cells have been returned to their owners and can now be used as reference standards in simulator testing of cells and arrays.
Author
Balloon Flight; Calibrating; Solar Cells; Modules; Fabrication

20000050217 Department of Energy, Office of Financial Management and Controller, Washington, DC USA
Small sample properties of an adaptive filter with application to low volume statistical process control
Crowder, S. V.; Eshleman, L.; Dec. 31, 1998; 37p; In English; American Statistical Association/American Society for Quality Control fall technical conference
Report No.(s): DE98-007178; SAND-98-1109C; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In many manufacturing environments such as the nuclear weapons complex, emphasis has shifted from the regular production and delivery of large orders to infrequent small orders. However, the challenge to maintain the same high quality and reliability standards white building much smaller lot sizes remains. To meet this challenge, specific areas need more attention, including fast and on-target process start-up, low volume statistical process control, process characterization with small experiments, and estimating reliability given few actual performance tests of the product. In this paper the authors address the issue of low volume statistical process control. They investigate an adaptive filtering approach to process monitoring with a relatively short time series of autocorrelated data. The emphasis is on estimation and minimization of mean squared error rather than the traditional hypothesis testing and run length analyses associated with process control charting. The authors develop an adaptive filtering technique that assumes initial process parameters are unknown, and updates the parameters as more data become available. Using simulation techniques, they study the data requirements (the length of a time series of autocorrelated data) necessary to adequately estimate process parameters. They show that far fewer data values are needed than is typically recommended for process control applications. and they demonstrate the techniques with a case study from the nuclear weapons manufacturing complex.
NTIS
Adaptive Filters; Process Control (Industry)

20000050220 Massachusetts Inst. of Tech., Cambridge, MA USA

Microchemical Systems and Their Applications Workshop ***Final Report, 15 Apr. 1999 - 29 Mar. 2000***

Jensen, Klavs F., Massachusetts Inst. of Tech., USA; Fedkiw, Peter, Massachusetts Inst. of Tech., USA; Nowak, Robert, Massachusetts Inst. of Tech., USA; Paur, Richard, Massachusetts Inst. of Tech., USA; Mar. 29, 2000; 832p; In English, 16-18 Jun. 1999, Reston, VA, USA

Contract(s)/Grant(s): DAAD19-99-1-0184

Report No.(s): AD-A375689; ARO-40089.1-CH-CF; No Copyright; Avail: CASI; A10, Microfiche; A99, Hardcopy

This report summarizes presentations, discussions and conclusions from the Workshop, "Microchemical Systems and Their Applications," held June 16-18, 1999, in Reston, Virginia USA. The objectives were to establish: (1) for which application areas microreactors would have potential, (2) essential scientific problems that would have to be solved to realize particular devices, and (3) the time scale for developing microreactor technologies. The workshop also reviewed fabrication techniques beyond standard silicon based MEMS processes and incorporating metals, polymer, and ceramics. The workshop participants reflected the multidisciplinary nature of microchemical system research and represented government, industry and university organizations. The format consisted of invited talks reviewing the state-of-the-art in microchemical systems, application needs, and relevant fabrication issues. These issues were further elaborated upon in a poster session. The presentations and posters were followed by three breakout sessions addressing specific objectives of the workshop, specifically (1) Opportunities for microenergy devices, (2) Challenges and needs in microfabrication and materials, and (3) Chemical applications of microchemical systems. Promising applications of microreaction technology were identified along with needs for microreaction technology research and development. The report contains of an executive summary, background information, summaries from the working group, and copies of presentations and posters.

DTIC

Conferences; Chemical Composition; Microelectromechanical Systems; Ceramics; Electricity

20000052450 Army Research Lab., Sensors Directorate, Adelphi, MD USA

Strip Cell Stack Design and Mass Transfer Phenomena in a Polymer Electrolyte Membrane Fuel Cell Stack ***Progress Report, Oct. 1998-Sep. 1999***

Jiang, Rongshong; Chu, Deryn; Feb. 2000; 20p; In English

Report No.(s): AD-A375261; ARL-TR-2063; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A type of air-breathing polymer electrolyte membrane fuel cell (PEMFC) stack with a strip design structure was investigated. Potential-current curves for this PEMFC show typical mass transfer behavior. An empirical equation was developed to describe the kinetic processes of the stack, as opposed to only a single cell. A series of experimental potential-current and power-current curves including different humidities, temperatures, and stack lengths was extremely well fitted with the equation. A concept of mass transfer impedance is defined in this report. This empirical equation can be used to calculate the mass-transfer impedance quantitatively beyond the experimental points, for example, with decreasing humidity, where the mass-transfer impedance increases considerably.

DTIC

Mass Transfer; Impedance; Electrolytic Cells; Fuel Cells

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ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20000045199 NASA, Washington, DC USA

Present State of Knowledge of the Upper Atmosphere 1999: An Assessment Report, Part 2 ***Final Report, 1 Oct. 1996 - 30 Sep. 1999***

Kurylo, M. J., NASA, USA; DeCola, P. L., NASA, USA; Kaye, J. A., NASA, USA; March 2000; 182p; In English

Report No.(s): NASA/TP-2000-210016/PT2; NAS 1.60:210016/PT2; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This document is issued in response to the Clean Air Act Amendment of 1990, Public Law 101-549, which mandates that the National Aeronautics and Space Administration (NASA) and other key agencies submit triennial reports to the Congress and the Environmental Protection Agency. NASA specifically is charged with the responsibility of reporting on the state of our knowledge of the Earth's upper atmosphere, particularly the stratosphere. Part l of this report summarizes the objectives, status, and accomplishments of the research tasks supported under NASA's Upper Atmosphere Research Program and Atmospheric Chemis-

try Modeling and Analysis Program for the period of 1997-1999. Part 2 (this document) is a compilation of several scientific assessments, reviews, and summaries. Section B (Scientific Assessment of Ozone Depletion: 1998), Section C (a summary of the 1998 Stratospheric Processes and their Role in Climate, SPARC, ozone trends report), Section D (the policymakers summary of the Intergovernmental Panel on Climate Change, IPCC, report on Aviation and the Global Atmosphere), and Section E (the executive summary of the NASA Assessment of the Effects of High-Speed Aircraft in the Stratosphere: 1998) are summaries of the most recent assessments of our current understanding of the chemical composition and the physical structure of the stratosphere, with particular emphasis on how the abundance and distribution of ozone is predicted to change in the future. Section F (the executive summary of NASA's Second Workshop on Stratospheric Models and Measurements, M&M 11) and Section G (the end-of-mission statement for the Photochemistry of ozone Loss in the Arctic Region in Summer, POLARIS, campaign) describe the scientific results for a comprehensive modeling intercomparison exercise and an aircraft and balloon measurement campaign, respectively. Section H (Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling: Update to Evaluation Number 12 of the NASA Panel for Data Evaluation) highlights the latest of NASA's reviews of this important aspect of the atmospheric sciences. A list of contributors to each of the included documents appears in Section I of this report.
Author
Congressional Reports; Upper Atmosphere; Climate Change; Atmospheric Models; Atmospheric Chemistry; Ozone; Environment Protection; Chemical Composition

20000046625 Radiological Protection Inst. of Ireland, Dublin, UK
Radon in dwellings the National Radon Survey Galway and Mayo
McGarry, A. T.; Fennell, S. G.; Mackin, G. M.; Madden, J. S.; OColmain, M.; Jul. 31, 1999; 14p; In English
Report No.(s): DE99-634363; RPII-99/1; No Copyright; Avail: Department of Energy Information Bridge

This report presents the results of the final phase of the National Radon Survey carried out by the Radiological Protection Institute of Ireland. The counties included in this phase are Galway and Mayo. The average radon concentrations for the houses measured in these counties were 112 Bq / cu m and 100 Bq /cu m, respectively. The measurement data were grouped on the basis of the 10 km grid squares of the Irish National Grid System and used to predict the percentage of dwellings in each grid square which exceeds the Reference Level of 200 Bq / cu m. Grid squares where this percentage is predicted to be 10% or higher are designated High Radon Areas. The health effects of exposure to high radon levels are discussed and recommendations are made regarding both new and existing dwellings.
NTIS
Radon; Surveys; Radiation Protection

20000047264 North Atlantic Treaty Organization, Special Working Group 12, Brussels, Belgium
SWG/12 Maritime Environmental Protection Strategy
Koss, Larry, North Atlantic Treaty Organization, Belgium; Alig, Craig S., Naval Surface Warfare Center, USA; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 1-1 - 1-20; In English; See also 20000047263; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

NATO naval ships operating in the 21st century will be expected to meet increasingly stringent environmental regulations. Special Working Group 12 (SWG/12) has a comprehensive shipboard pollution abatement program under way that will enable ships of the 21st century to be environmentally sound. The goal is for ships to operate worldwide with minimal potential for regulatory constraints, no inappropriate dependence on shore facilities, and no unreasonable costs imposed by environmental regulations. The basic strategy is to: design and operate ships to minimize air emissions, waste generation, and optimize waste management, and, where required, develop shipboard systems that will destroy or appropriately treat the wastes generated on board. If wastes are unavoidable and cannot be destroyed or sufficiently treated so that overboard discharges are not considered environmentally significant, they must be retained on board for recycling or treatment ashore. Although the ultimate solution for on-board destruction has not been achieved for any shipboard wastestream, the members of SWG/12 have made considerable progress toward developing on-board capabilities for managing, treating, or processing solid wastes, oily wastes, hazardous materials, and medical wastes. They are still seeking satisfactory interim or long-term solutions for treating blackwater and graywater, but they have identified technologies with potential to treat these wastes, and development programs are in hand. International cooperative efforts to achieve environmentally sound ships are under way among NATO navies to share information and technologies, and to save time and money.
Derived from text
Environment Protection; Pollution Control; Waste Management; Ships; Navy

20000047265 Stockholm Environment Inst., Tallinn Centre, Tallinn Estonia

Estonian Experiences in Application of Environmental Management

Tammemae, Olavi, Stockholm Environment Inst., Estonia; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 2-1 - 2-6; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

This report describes the development of two important environmental management tools used in Estonia: (1) Environmental Impact Assessment; and (2) Environmental Auditing.

CASI

Environment Management; Estonia

20000047266 Bundesamt fuer Wehrtechnik und Beschaffung, Koblenz, Germany

Environmental Impact Analysis as a Tool for Environmentally Sound Development

Grunert, Christian, Bundesamt fuer Wehrtechnik und Beschaffung, Germany; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 3-1 - 3-6; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

All human activities cause environmental burdens. The question is whether these burdens are necessary and how great they will be. The amount of environmental impact of a system, either a civil or military one, is defined in the development process. So it is important to take environmental issues into account as early as possible in this process. Environmental issues must be an integral part of every development. The environmental guideline in the procurement process is to develop and to obtain defence materiel that fulfills the military and technical requirements and pollutes the environment as little as possible. For military items, the main emphasis is on operation and disposal during peacetime. The environmental issues during the procurement process can be summarised in the following goals: (1) Saving of energy; (2) preservation of resources; (3) prevention and disposability of waste; (4) reduction of emissions; (5) replacement of hazardous and radioactive materials; (6) preservation of bodies of water; and (7) prevention of soil contamination. These aspects which are very broad will be taken into account during the whole process. Throughout the whole process environmental considerations should be on par with other considerations, such as effectiveness, quality, military life-cycle costs, and terms of delivery.

Derived from text

Environment Management; Procurement; Military Operations

20000047268 Institute for Defense Analyses, Alexandria, VA USA

Information Dissemination for Pollution Prevention

Brenner, Alfred, Institute for Defense Analyses, USA; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 5-1 - 5-10; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Pollution prevention for NATO and the Partners for Peace (PfP) nations within the framework of environmental security is a complex and pervasive issue. There are many facets to pollution prevention and reclamation of resources previously polluted by both military and civilian activities. NATO air, land, and sea military operations must take cognizance of these matters without unduly limiting or restricting their efficacy. and new understandings of the matter, changing natural environmental laws, and international agreements are generating a multitude of new approaches to coping with these issues. As the NATO and PfP nations separately and jointly strive to develop processes and introduce new innovative approaches to solve these problems, there will be a large amount of experimental data that can be accumulated and shared. Much leverage may be realized with broad dissemination of the experiences of all the participating nations. The successes in one context or in one nation should be studied for applicability by others. Thus, it is most important to facilitate the timely dissemination of accurate and relevant data and analyses of each country's experiences. Over the last three years, a project for the Committee on the Challenges of Modern Society (CCMS), the Environmental Clearing House System (ECHS), has developed a worldwide electronic data and information exchange system. The ECHS was developed with the understanding that the participants would be geographically widely separated and be serviced with widely different levels of computer capability and knowledge, and communications infrastructure. This system is a good model for methods to effectively disseminate information within the pollution prevention community.

Derived from text

Environment Protection; Data Processing; Information Dissemination; Pollution Control

20000047269 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Inst. for Physics of the Atmosphere, Oberpfaffenhofen, Germany

Impact of Aircraft Emissions on the Global Atmosphere

Sausen, Robert, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; Schumann, Ulrich, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 7-1 - 7-34; In English; See also 20000047263; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Aviation is a very fast growing economic sector. For instance, in 1998 the number of passengers travelling with Deutsche Lufthansa grew by 9% relative to the previous year. Globally the annual increase rate in air transportation is more than 5%. The rapidly increasing demand for air transport outpaces technological improvements in aircraft and improvements in air traffic management systems: the mean annual increase rate of fuel burn was 2.2% for the years 1985 to 1995. Similar increase rates are expected for the future. Aircraft emit gases (CO2, H2O, NO, SO2, UHC, etc.), aerosols (e.g., soot) and aerosol precursors (e.g., SO3, H2SO4). Hence, aircraft modify the composition of the atmosphere either directly due to these emissions or indirectly via chemical processes, e.g., NO, modifies the ozone concentration. The main concern related with these emissions is the potential for climate change by perturbing the Earth's radiative budget as a result of several processes: (1) the emission of radiatively active substances (e.g. CO2 or H2O); (2) the emission of chemical species which produce or destroy radiatively active substances (like NOx, which modifies the O3 concentration, or SO2, which oxidizes to sulfate aerosols); (3) the emission of substances (e.g. H2O, soot) which trigger the generation of additional clouds (e.g. contrails). Due to the internal variability of the atmosphere, it is extremely difficult to detect the climatic impact of a single economic sector in climate observations or in simulations with comprehensive climate models. Therefore we consider the radiative forcing (RF) associated with various perturbations of the atmospheric composition. RF is known to be a good predictor of global climate change in terms of variables like the global mean surface temperature change or mean sea level rise. On average the global mean surface temperature increases by 0.6 K per 1 Wm(exp -2) of RF. In the following we consider various individual contributions to the radiative forcing and concentrate on 1992 and 2050. While the current and past emissions of aviation are reasonably well known, we have no reliable forecasts of the future. Hence, we make use of emission scenarios, which have been developed for various economic and technological assumptions. We study in greater detail the aviation scenario Fa1 that makes similar economic assumptions as the IPCC scenario IS92a for all anthropogenic emissions. In the latter scenario the CO2 concentration increases by 0.6% annually. The aviation scenario Fa1 assumes a mean annual increase rate of 1.7% for the fuel burn until 2050.

Derived from text

Exhaust Gases; Exhaust Emission; Atmospheric Composition; Climate Change; Air Transportation; Radiative Transfer

20000047270 Ministry of Defence, London, UK

UK Ministry of Defence Use of Ozone Depleting Substances: Implications of the New European Council Regulation

Liddy, D. J., Ministry of Defence, UK; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 8-1 - 8-6; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The Montreal Protocol controls the production of the ozone depleting substances. These have been used extensively in fire protection and refrigeration in military equipment and systems. The implications of the Protocol for the military forces of NATO states were covered in LTSS/44, and the worthy conclusions and recommendations were reported in the opening sessions of the Symposium. The current legislative position on ozone depleting substances within the European Union is described. The policies that the UK Ministry of Defence has in place, and the progress that has been made, so far, in reducing use of the substances is discussed. of course, legislation continually evolves, so the recent developments in the European Union, finally suggesting that NATO could, perhaps, play a valuable, more proactive, part in the development of new international environmental legislation is summarized.

Derived from text

Environment Protection; International Law; Ozone Depletion; Air Pollution; Refrigerants; Chlorofluorocarbons

20000047272 Ministry of Environmental Protection and Regional Development, Riga, Latvia

Site Contamination Problems in the Republic of Latvia: Ongoing Clean-up Activities and Future Pollution Prevention Plans

Strauss, llgonis, Ministry of Environmental Protection and Regional Development, Latvia; Semyoniv, Ivan, Ministry of Environmental Protection and Regional Development, Latvia; Blumberga, Una, Ministry of Environmental Protection and Regional Development, Latvia; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 10-1 - 10-8; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Today the problem of site pollution in the Republic of Latvia is becoming more and more important not only as an environmental problem, but also as one, which hinders the growth of economics because it creates difficulties for investments. In the Environmental Policy Plan of Latvia, officially approved in 1995, the site pollution problem was not identified as the first priority. At that period such issues as drinking water supply & wastewater treatment, waste management and air pollution problems were considered as more urgent. Presently situation has changed and site contamination problem is one of those which needs be solved within the near future.
Derived from text
Environment Management; Military Operations; Latvia; Environmental Cleanup; Decontamination

20000047273 Department of National Defence, Ottawa, Ontario Canada
Pollution Prevention in the Land Maintenance System
Beshai, Joan, Department of National Defence, Canada; Berthiaume, Holmer, Department of National Defence, Canada; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 11-1 - 11-6; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper presents the implementation plan for the Sustainable Development Strategy in maintenance workshops serving the Canadian Land Forces. Workshop surveys were conducted during which opportunities for pollution prevention and impediments to positive changes were identified. Reducing sources of pollution was the primary goal but reducing costs and improving working conditions were also considered. This initiative will reduce the amount of hazardous materials used and the amount of spent material, which must be disposed of as hazardous waste. Existing equipment is being audited and the requirement for use of high-risk consumables is being reviewed to eliminate or reduce their use. A material substitution program has made progress in lessening the dependence on high-risk products. The paper also discusses progress in developing and integrating the building blocks of an information system designed to track the consumption of hazardous materials and the generation of waste, to identify products containing targeted substances and to evaluate the relative hazards of products required to operate and maintain equipment.
Author
Hazardous Materials; Pollution Control; Canada; Environment Pollution; Environmental Cleanup

20000047274 Vilnius Gediminas Technical Univ., Vilnius, Lithuania
Strategy of Military Lands Reusing in Lithuania
Baltrenas, P., Vilnius Gediminas Technical Univ., Lithuania; Ignatavicius, G., Vilnius Gediminas Technical Univ., Lithuania; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 12-1 - 12-8; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The Soviet army left Lithuania in 1993. Upon withdrawal they have left about 500 various military installations. There were 277 Soviet military bases in which 462 military units were located at that time. Sizes of military sites varied in a rather wide scale - from less then 100 sq m (workshops) to nearly 14000 ha (forestry). Military sites according to their sizes are presented. All military sites occupied territories of 67762 ha, which make 1.04% of Lithuania's territory. Currently, 16.7% of the territory has been left to satisfy the Lithuanian military needs and the rest has been transferred to civil users.
Derived from text
Lithuania; Military Operations; Land Management; Environment Management

20000047275 Ministry of Defence of the Czech Republic, Olomouc, Czech Republic
Socio-political Tools in the Implementation of Environmental Pollution Prevention at Military Bases
Kozl, Petr, Ministry of Defence of the Czech Republic, Czech Republic; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 13-1 - 13-4; In English; See also 20000047263; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

Our technical society is often forgetting about a human role. However, the human role is still very important to function of a technical and technological systems. Not only the technologies but also socio-political tools are also necessary to the implementation of environmental pollution prevention at military bases.
Author
Environment Pollution; Environment Protection; Military Operations

20000047279 Academy of Sciences of the Georgian SSR, Tbilisi, Georgia
Remedial Proposals for Former Military Lands in Georgia
Zakariadze, Nino, Academy of Sciences of the Georgian SSR, Georgia; Approaches to the Implementation of Environment Pollu-

tion Prevention Technologies at Military Bases; April 2000, pp. 17-1 - 17-4; In English; See also 20000047263; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

The state of the environment in Georgia is influenced clearly by political and economic situation of the recent several years and the consequences of it are the pollution and disorder of natural equilibrium in different regions to a great extent. The survey concerning the state of former military regions in our country is an initial attempt for the solution of one of the specific issues of this global problem. After withdrawal of former Soviet Troops from the territory of Georgia and transmission of their former military bases to Georgian Government, in already heavily polluted country new problems have emerged. The question is the toxic and explosive substances, harmful waste, most of which is unfit and is not liable to utilisation. For example, near the coast of Black Sea, and in Eastern Georgia as well, more than thousand tons of liquid rocket fuel components as ”Melange” and ”Simine” are distributed without control, which creates significant risk for the population and environment. Some cases of their spilling without neutralisation into the Black Sea, leakage in soil and even explosion are observed. The reservoirs of the fuel are located near to Soganlugi, Meria, Chaladidi regions and Supsa pipeline construction. Part of them is deformed and part of them damaged. Because of expiration, the pressure in some of them has dangerously increased. According to former Soviet Army instructions ”Melange” was neutralised with the water solution of caustic sodium and ”Simine” with solution of bohr acid and after mixing with kerosene were burnt. The technological scheme is hardly acceptable from the environmental point of view. The new schemes for rendering harmless these substances are suggested which inevitably need special scientific processing. Increase of radioactive background is observed in various regions of former Military Troops (Vaziani, Lilo, Abastumani, Senaki, Telavi, Poti, Kutaisi, Kopitnari). The radiation is caused by parts of damaged radiometric equipment with the source of radiation, which are distributed without control from rubbish heaps even to apartments and yards of the habitants. Concerning this problem on October 9, 1997, by the order of President of Georgia the special Governmental Commission was established, whose objective is to study chemical and radioactive pollution in the territories transmitted to Georgian Governmental structures by the Soviet troops. Because of deficiency of means and special equipment the commission has to work in extremely hard conditions. That influences a quality of work and increases hazards and disaster likelihood. by the members of this commission in collaboration with representatives of International Agency of Nuclear Energy, the area for temporary storage of radioactive waste has been chosen, which has to meet the international norms and will be in action after completing of corresponding work. Again the lack of finances creates constrains. One of the main reasons of these events is incomplete special form of the document concerning territory transmission, from one side to another and the absence of a specific law on the issue. The Laws of Georgia on Environmental Permit and on State Environmental Assessment do not contain specific articles for creating necessary documents and delineating responsibilities for each side. Apart from the Ministry of Environment and Natural Resources Protection, there are more than hundred environmental NGO’s in Georgia. But in spite of this number, co-ordinated and purposeful work in this field is not carried out. Due to this situation the group of Georgian scientists from Institutes of Geophysics, Physiology, Academy of Science supported by Ministry of Defense, Parliamentary Security Committee and the Department of Political-Military Affairs of Georgia express the willingness to conduct the special research and field works.

Derived from text

Environment Protection; Georgia (Eurasia); Radiation Hazards; Toxic Hazards; Waste Disposal; Hazardous Wastes; Environmental Cleanup

20000047281 Military Univ. of the Ground Forces, Czech Republic

Waste Management Compliance in the Army of the Czech Republic

Komar, Ales, Military Univ. of the Ground Forces, Czech Republic; Bozek, Frantizek, Military Univ. of the Ground Forces, Czech Republic; Dvorak, Jiri, Military Univ. of the Ground Forces, Czech Republic; Hoza, Ignac, Military Univ. of the Ground Forces, Czech Republic; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 19-1 - 19-6; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The key area in providing environmental safety is the issue of effective management of waste being created during the daily life and training of troops. Law No 125/1987 concerning wastes, which came into existence last year, is the fundamental regulation in the Czech Republic. The law determines the liabilities in wastes disposal and prevention of their origin and it modifies supervision by state authorities and their decision-making process. It fully applies to the military sector with only one specific enactment - records of wastes produced by the Ministry of Defence are processed and kept by this Ministry in cooperation with the Ministry of Environment.

Author

Waste Management; Czech Republic; Environment Management

20000047282 Norwegian Defence Construction Service, Oslo, Norway

Haakonsvern Naval Base, Bergen-Norway Pollution Prevention of PCB-Contamination in Sea Sediments

Morch, Torgeir, Norwegian Defence Construction Service, Norway; Laugesen, Jens, Det Norske Veritas, Norway; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 20-1 - 20-4; In English; See also 20000047263; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

In this paper the prevention of PCB-contamination in sea sediments at the Haakonsvern Naval Base in Bergen, Norway is discussed.

Author

Norway; Pollution Control; Polychlorinated Biphenyls; Environment Management

20000047283 Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Berlin, Germany

The Clean-up of Contaminated Military Sites, Consequences for a Pollution Prevention Approach, Requirements from a Viewpoint of Environmental Protection

Szelinski, B. A., Federal Ministry for the Environment, Germany; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 22-1 - 22-8; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

This seminar is held as a follow up of the NATO Study on ”Environmental Technologies” which was concluded in September 1996. The focus of this study was to get a better understanding of contamination from military sources, to identify existing or evolving technologies and strategies to minimize environmental impacts of military operations and its areas for potential application in the military, and to identify research and development activities which may be required in the future. The study was focused on the following substances: Petroleum, Oil and Lubricants (POLs), Munitions, Energetics, and Propellants, Ozone Depleting Substances (ODS), Fire Suppressants and Refrigerants, Volatile Organic Compounds (VOCs), Solvents and Surface Cleaners, Inorganic Surface Coatings, Organic Surface Coatings, Shipboard Liquid Waste, Shipboard Solid Waste, and Pesticides. The military and the environment is a fascinating issue, since this is almost the only field in modern societies, where there is a certain prerogative when it comes to environmental protection, to environmental information and to environmental action. Additionally the military loves to have an aura of secrecy around what it does and, there are rumors also around what it does not do. It is encouraging to see that there is a growing concern about the environmental impacts of peacetime military operations. and the whole setting of this study is fascinating, since it produces a deja vue feeling at least for people who look at it from a view point of environmental administrations.

Derived from text

Environment Protection; Military Operations; Pollution Control; Contamination; Environmental Cleanup

20000047285 Defence Evaluation Research Agency, Mechanical Sciences Sector, Farnborough, UK

The UK MOD Approach to the Reduction of VOC’s at Service Bases

Higgs, M. S., Defence Evaluation Research Agency, UK; Hitchen, C. J., Defence Evaluation Research Agency, UK; Patel, J., Defence Evaluation Research Agency, UK; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 24-1 - 24-10; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Environmental legislation has forced the Royal Air Force, Army and Royal Navy to perform a critical and comprehensive review of both the processes they undertake and the types of materials they use. The paints and coatings world, in particular, faces many challenges and the UK MOD as a significant user of paints and paint removers has to address the problems associated with meeting environmental pressures whilst retaining existing performance criteria. This paper will outline the legislation contained within the Environmental Protection Act (EPA) which has been introduced to control the atmospheric discharge of volatile organic compounds (VOCs) and will highlight the consequent implications to the UK MOD. The alternative technical solutions to ensure compliance with the legal requirements including ”Compliant Coatings” will be discussed. Although the UK MOD faces many challenges within the painting and paint removal field, this paper will concentrate on the refinishing of military vehicles and aircraft and associated processes. These are priority areas, as this process involves a significant consumption of paint materials and, therefore, high volumes of VOC. Work undertaken to introduce compliant coatings as alternatives to traditional solvent based products is detailed and the programme highlights the effective co-operation between the Defence Evaluation & Research Agency (DERA), Army and Royal Air Force Departments and the Directorate of Standardisation. The approach by these departments to reduce the consumption of VOC’s from supplementary processes to painting are also outlined. In addition, a brief review of the approach adopted by the Royal Navy will be discussed. As part of the process the various phases of the project will be discussed. This covers the definition of MOD requirements, which can be unique to the Defence arena. It will review laboratory based perfor-

mance testing, user trials of the materials and the development of the materials specification concluding with the production of Standards for the materials.
Author
Environment Protection; Organic Compounds; Military Operations; Pollution Control

20000047287 Military Univ. of Technology, Warsaw, Poland
Investigations into Risk Assessment and Cost Analysis as Tools for Pollution Prevention During Military Exercises and Training
Neffe, Slawomir, Military Univ. of Technology, Poland; Malecki, Mark, Ministry of National Defence, Poland; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 27-1 - 27-8; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Military forces are big and diverse organisation with heavy demands for equipment, chemicals and other materials when conducting training, exercises and day to day missions. Military forces are also producers of large quantity of hazardous and harmful wastes, which in the field conditions can have strong negative influence on the environment. Many of these wastes are similar to those of large civilian industrial organisations, but some are peculiar to the army mission. The main purpose of the presentation is to show ideas developed for estimation of environmental losses and costs resulting from military exercises and training activities of land troops, navy and airforce. The legislative, economic and technical tools, which lead to the minimization of the environmental damages during the military training and exercises, are discussed. Types of military training activities and materials, which have the most severe environmental impact, have been identified. Furthermore, the paper describes measures undertaken within the military sector to face the environmental standards and regulations relating to national guidelines on air, water, soil, and nature protection during the military training and exercises.
Author
Assessments; Cost Analysis; Hazardous Wastes; Pollution Control; Risk

20000050360 Environmental Protection Agency, Office of Pollution, Prevention, and Toxics, Washington, DC USA
Presidential Green Chemistry Challenge Awards Program: Summary of 1999 Award Entries and Recipients
Mar. 2000; 90p
Report No.(s): PB2000-104782; EPA/744/R-00/001; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

President Clinton announced the Green Chemistry Challenge on March 16, 1995, as one of his Reinventing Enviornmental Regulations Initiatives. EPA Administrator Carol Browner announced the Green Chemistry Challenge Awards Program on October 30, 1995. This document provides summaries of the entries received for the 1999 Presidential Green Chemistry Challenge Awards. The approaches described in these summaries illustrate how numerous individuals, groups, and organizations from academia, small businesses, industry, and government are demonstrating a commitment to designing, developing, and implementing green chemical methodologies that are less hazardous to human health and the environment. The approaches described in these summaries also illustrate the technical and economic feasibility of implementing green chemical methodologies and are recognized for their beneficial scientific, economic, and environmental impacts.
NTIS
Awards; Alternatives; Commerce; Economic Impact; Industries; Presidential Reports

20000050361 Environmental Protection Agency, Office of Water, Washington, DC USA
Technical Development Document for the Final Action Regarding Pretreatment Standards for the Industrial Laundries Point Source Category (Revised March 2000)
Mar. 2000; 518p; In English
Report No.(s): PB2000-104260; EPA/821/R-00/006; No Copyright; Avail: CASI; A22, Hardcopy; A04, Microfiche

;Table of Contents: Summary; Background; Data Collection Methodology and Information Sources; Industry Profile; Water Use, Wastewater Characterization, and Pollutants of Concern; Pollution Prevention, Recycling, Treatment, and Disposal Technologies Employed by the INDustrial Laundries Industry; Treatment Performance Data Used for the Development of Candidate Pretreatment Standards; Development of Technology Control Options; Pollutant Loading and Removal Estimates; Non-Water Quality Environmental Impacts; Costs of Technology Bases for Regulatory Options; Glossary of Terms; Appendix A - Tables Referenced in Chapter 3; Appendix B - Tables Referenced in Chapter 4; Appendix C - Tables Referenced in Chapter 5; Appendix D - Tables Referenced in Chapter 7; and Appendix E - Tables Referenced In Chapter 9.
NTIS
Pretreatment; Contaminants; Waste Water; Recycling; Information Systems

20000050362 Environmental Protection Agency, Office of Water, Washington, DC USA

Cost-Effectiveness Analysis for the Final Action Regarding Pretreatment Standards Category (Revised March 2000) ***Final Report***

Mar. 2000; 44p; In English

Report No.(s): PB2000-104259; EPA/821/R-00/005; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report supports the analysis of options and cutoffs considered as pretreatment standards for the industrial laundries industry. In this document, the total annualized cost of each of two regulatory options are compared to the corresponding effectiveness of that option, at the cutoffs, considered in reducing the discharge of pollutants. Section Two discusses EPA's cost-effectiveness methodology and identifies the pollutants included in the analysis. This section also presents EPA's toxic weighting factors for each pollutant and considers the removal efficiency of each option. Section Three presents the results of the cost-effectiveness analysis. In section Four, the cost-effectiveness value for the regulatory option and cutoff considered for the pretreatment standards is compared to cost-effectiveness values for other proposed and promulgated rules. Appendix A and B present the pollutant reduction and costs for all cutoffs considered under the two options that EPA considered during its decisionmaking process.

NTIS

Cost Effectiveness; Pretreatment; Contaminants; Decision Making

20000050478 Washington Univ., Seattle, WA USA

Coupling Satellite and Ground-Based Instruments to Map Climate Forcing by Anthropogenic Aerosols ***Final Report, 16 Dec. 1996 - 15 Aug. 1999***

Charlson, Robert J., Washington Univ., USA; Anderson, Theodore L., Washington Univ., USA; May 18, 2000; 10p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG1-1877

Report No.(s): Rept-61-8393; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Climate forcing by anthropogenic aerosols is a significant but highly uncertain factor in global climate change. Only satellites can offer the global coverage essential to reducing this uncertainty; however, satellite measurements must be coupled with correlative, in situ measurements both to constrain the aerosol optical properties required in satellite retrieval algorithms and to provide chemical identification of aerosol sources. This grant funded the first two years of a three-year project which seeks to develop methodologies for combining spaceborne lidar with in-situ aerosol data sets to improve estimates of direct aerosol climate forcing. Progress under this two-year grant consisted in the development and deployment of a new in-situ capability for measuring aerosol 180' backscatter and the extinction-to-backscatter ratio. This new measurement capacity allows definitive lidar/in-situ comparisons and improves our ability to interpret lidar data in terms of climatically relevant quantities such as the extinction coefficient and optical depth. Measurements were made along the coast of Washington State, in Central Illinois, over the Indian Ocean, and in the Central Pacific. Thus, this research, combined with previous measurements by others, is rapidly building toward a global data set of extinction-to-backscatter ratio for key aerosol types. Such information will be critical to interpreting lidar data from the upcoming PICASSO-CENA, or P-C, satellite mission. Another aspect of this project is to investigate innovative ways to couple the lidar-satellite signal with targeted in-situ measurements toward a direct determination of aerosol forcing. This aspect is progressing in collaboration with NASA Langley's P-C lidar simulator and radiative transfer modeling by the University of Lille, France.

Author

Mapping; Climate Change; Aerosols; Anthropometry; Simulators; Optical Properties; Climatology; Algorithms

20000051520 Zapata Engineering, Charlotte, NC USA

Transportation Conformity: We're All in This Together. Instructor's Manual

1999; 122p; In English

Report No.(s): PB2000-103224; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Clean Air Act and the Intermodal Surface Transportation Efficiency Act (ISTEA), and more recently the Transportation Equity Act for the 21st Century (TEA-21), brought together the two issues of air quality and transportation. An important concern is the quality of the air you breath. In the past, air pollution was seen only as an urban problem, not a local or rural one. But this is no longer true. These areas must become familiar with the transportation conformity issue and how it affects them. Another important concern is that of funding. Funding of transportation projects can be greatly affected if you do not fully understand the Clean Air Act requirements, especially with respect to transportation conformity. With a clear understanding of what is required, you who are in the transportation sector can help to simultaneously achieve two important goals;clean air and improved mobility.

NTIS

Air Pollution; Air Quality; Transportation

46
GEOPHYSICS

Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see 47 Meteorology and Climatology; and 93 Space Radiation.

20000045704 Tokyo Univ., Earthquake Research Inst., Japan
Conductivity Anomaly Around the Japanese Islands
Utada, H., Tokyo Univ., Japan; Hamano, Y., Tokyo Univ., Japan; Segawa, J., Tokyo Univ., Japan; The School of Marine Science and Technology, Tokai University: Collected Reprints for the Years 1996-1997; February 1998; ISSN 0389-2050; Volume 27, pp. 55-101; Repr. from Geology and Geophysics of the Japan Sea (Terra Scientific Publishing Co.), v. 1, 1996 p 103-149; In English
Report No.(s): Contribution-B-548; Copyright; Avail: Issuing Activity

Electrical conductivity structure beneath the Japanese Islands and surrounding oceans has been obtained across the northeastern and the central parts of Japan. Two-dimensional direct inversion was employed for the model determination. Data set consists of the result of land measurements by Research Group for Crustal Resistivity Structure, Japan, and that of sea floor measurements using OBM (Ocean Bottom Magnetometer) and OBE (Ocean Bottom Electrometer). The structure beneath the Pacific Ocean and the Japan Sea can be summarized as follows: (1) Beneath the Pacific plate and the Philippine Sea plate, high conductive layers are identified at the depth of about 150 km and 30 km, respectively. (2) On the top of the subducting plate, a thin (about 10 km or less) conductive layer exists, which can be traced deep beneath the Japanese Islands. (3) The crust and the upper mantle are rather resistive beneath the Japan Sea. The most recent observational result in 1986 also indicated no existence of shallow high conductive layer under the Yamato Basin. These observations imply a different origin of the Japan Sea compared with the normal oceanic plate.
Author
Anomalies; Islands; Japan; Conductivity; Electrical Properties

20000045705 Tokyo Univ., Ocean Research Inst., Japan
Electrokinetic Signature of the Nankai Trough Accretionary Complex: Preliminary Modelling for the Kaiko-Tokai Program
Heinson, Graham, Flinders Univ., Australia; Segawa, Jiro, Tokyo Univ., Japan; The School of Marine Science and Technology, Tokai University: Collected Reprints for the Years 1996-1997; February 1998; ISSN 0389-2050; Volume 27, pp. 33-53; Repr. from Physics of the Earth and Planetary Interiors (Elsevier), v. 99, 1997 p 33-53; In English
Report No.(s): Contribution-B-547; Copyright; Avail: Issuing Activity

Fluid flow in the Nankai Trough accretionary complex has been observed during the previous phases of the Kaiko project to be of order 100 m year (exp -1) in small-scale high-permeability conduits, and 10 m year (exp -1) where shallow detachment faults intersect the seafloor. The rate of flow was also variable, increasing by up to 30% over a month. Monitoring the fluid flow will be one of the principal objectives of the next phase of the Kaiko program, known as Kaiko-Tokai. One method is to measure the electric and magnetic fields generated by the electrokinetic phenomena (or streaming potential), resulting from fluid flow in the porous sediments. This paper describes modelling of fluid flow in the accretionary prism and the resulting electrokinetic signals which may be observed from sensors on the seafloor or in shallow boreholes. A two-dimensional finite-difference model is used to study the hydrogeology of a realistic section of the Nankai Trough, with constraints from seismic reflection data and Ocean Drilling Program boreholes. Fluid sources owing to porosity reduction in the prism and of distant external origin are modelled. We find that porosity reduction alone is insufficient to reproduce the observational estimates of excess pore pressure and fluid flux. Additional fluid source terms are therefore required along a low-angle decollement, or detachment fault, which separates the deformed prism sediments from the undeformed underthrust sediments beneath. The decollement must be significantly more permeable than the adjacent sediments (our models suggest by approximately four orders of magnitude), and is probably anisotropic parallel to the main structural trends. From the hydrogeological model, the electric potential and electric and magnetic fields within the ocean and sediments were calculated from the electrokinetic phenomena. Seafloor electric potentials are found to be of the order of a few millivolts, with seafloor horizontal and vertical electric fields of the order of 0.5 mu V m (exp -1) close to the deformation front. As the electric potential rises significantly with depth through the sediments, borehole measurements may be particularly useful. We conclude with some comments about noise sources and experimental logistics for the Kaiko-Tokai program.
Author
Electrokinetics; Hydrogeology; Troughs; Mathematical Models; Fluid Flow; Deposition

20000046725 Department of the Navy, Washington, DC USA

Atmospheric Ozone Concentration Detector

Roland, Charles M., Inventor; Mott, Peter H., Inventor; Oct. 26, 1999; 11p; In English; Supersedes US-Patent-Appl-SN-08625506, AD-D018594.

Patent Info.: Filed 29 Mar. 1996; US-Patent-Appl-SN-08,625,506; US-Patent-5,972,714

Report No.(s): AD-D019649; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An ozone detector in the form of two basic embodiments which can measure ozone concentration in ambient air at 0.001-1 ppm. The first embodiment includes a stretched elastic material and a standard which can give ozone concentration in response to degree of microcracking or frosting of the elastic material. The second embodiment includes a chamber containing a long strip of elastic material wound on a spool, a small amount of manganese dioxide in the chamber to neutralize any ozone therein so that the ozone does not attack and frost the elastic material, a take-up spool mounted away from the chamber and adapted to wind the material from the chamber, a component for stretching the material, a light source for generating a tight beam and illuminating the film between the chamber and the take-up spool and a detector for the light beam after the light beam passes through the material.

DTIC

Atmospheric Composition; Ozone; Ozone Depletion; Ozonosphere; Gas Composition; Atmospheric Chemistry

20000051526 Naval Research Lab., Ocean Sciences Branch, Bay Saint Louis, MS USA

Sediment Transport in the Western Interior Seaway of North America: Predictions from a Climate-Ocean. Sediment Model

Slingerland, Rudy; Keen, Timothy R.; Jan. 1999; 14p; In English

Report No.(s): AD-A375558; NRL/JA/7322--97-0038; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Whether from the foreshore, shoreface, shelf, or incised estuarine valleys, sedimentary deposits along the western edge of the Western Interior seaway quite uniformly record southerly directed paleoflows. Cardium Formation shoreface gravels at Willesden Green, Alberta, decrease in clast size to the southeast. Isoliths outlining clastic wedges, such as the Chalk Creek, are recurved to the south. Large-scale cross-strata in rocks considered to be either shelf sand ridges or detached shorefaces, such as the Kakwa and Musreau Members of the Cardium Formation and the Straight Cliffs Formation of southwestern Utah, indicate southerly directed paleocurrents. Estuarine incised valley-fills trend south or southeast, reflecting a high-stand shelf topography inherited by rivers as they cut across the inner shelf in response to a high-order sea-level drop. To explain this uniformity we conducted two numerical experiments that predict circulation and sediment transport paths in the seaway in response to 1) mean annual atmospheric forcing and 2) the passage of a mid-latitude winter storm. The mean annual forcing for the early Turonian is computed by GENESIS, an NCAR global climate model; the cyclone is computed using an idealized hurricane model. For the mean annual experiment, circulation of the seaway is computed using a three-dimensional, turbulent flow, coastal ocean model under the following initial and boundary conditions: (1) paleobathymetry according to a new interpretation of the litho-and biostratigraphy for the early Turonian; (2) fresh water runoff and precipitation-evaporation magnitudes as computed by GENESIS; (3) temperatures and salinities of the Boreal and Tethys Oceans based on GENESIS atmospheric temperatures; and 4) mean annual and daily wind stresses computed by GENESIS. For the storm experiment, circulation is forced solely by wind stresses.

DTIC

Sediment Transport; Sedimentary Rocks; Predictions; Climate Models; Ocean Models; Atmospheric Models

20000052201 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

An Analysis of Gravity-Field Estimation Based on Intersatellite Dual-1-Way Biased Ranging

Thomas, J. B., Jet Propulsion Lab., California Inst. of Tech., USA; April 1999; 208p; In English

Contract(s)/Grant(s): NAS7-1407

Report No.(s): JPL-Publ-98-15; Copyright; Avail: Issuing Activity

The GRACE mission is designed to make global, highly accurate measurements of the Earth's gravity field with high spatial resolution. Dual-1 -way biased range between two satellites is measured to very high precision through the exchange of K- and Ka-band sinusoidal signals. The version of dual-1 -way ranging developed by this report improves upon known earlier versions in a number of ways: highly accurate satellite-clock-synchronization corrections based on GPS data, better baseband phase extraction using highly digital processing, highly accurate USO-rate calibration based on GPS data, improved filtering for observable extraction, and parallel extraction of biased range, range rate and range acceleration. This report approximately models and analyzes this process, from the generation of the RF signals at the two satellites through the extraction of the geopotential. Based on improved dual-l-way processing and revised instrumental performance, the hypothetical acceleration approach used in this report

suggest that per-degree geoid errors on the order of 10 microns (degree greater than or equal to 50, 300-km altitude, 200-km range, 13-day fit) are feasible with respect to random errors due to system noise, USOs, and accelerometers.
Author
Numerical Analysis; Gravitational Fields; Earth Gravitation; Global Positioning System; High Resolution; Observation; Random Errors

20000052464 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Modern Uplift of the Transantarctic Mountains: Preliminary Results of an Autonomous GPS Array
Raymond, C. A., Jet Propulsion Lab., California Inst. of Tech., USA; Heflin, M. B., Jet Propulsion Lab., California Inst. of Tech., USA; Ivins, E. R., Jet Propulsion Lab., California Inst. of Tech., USA; James, T. S., Geological Survey of Canada, Canada; [1998]; 1p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

An autonomous GPS array is being implemented in the Transantarctic Mountains, sponsored by NSF and NASA, for the purpose of measuring uplift resulting from post-glacial rebound (PGR). The rebound of the solid earth due to unloading of ice since the Last Glacial Maximum is expected to dominate the measured uplift for most of West Antarctica, dwarfing the signals due to present-day ice sheet mass balance changes and tectonic motion, as long as mantle viscosity is greater than about 10(exp 20) Pa-s. Predicted uplift patterns have been calculated for a range of model scenarios, which illustrate how the uplift pattern might distinguish between different-sized ice sheets and deglaciation histories as represented by the competing models. The scenarios considered by James and Ivins (1998) include ICE-3G, CLIMAP and a variation of the CLIMAP model by Denton et al. For these models, peak uplift rates occur in the Transantarctic Mountains, and differences between models is often large there. Thus, the Transantarctic Mountains are an ideal place to obtain uplift measurements to constrain deglaciation models.
Derived from text
Antarctic Regions; Glaciers; Glaciology; Mass Distribution; Unloading

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20000050468 NASA Goddard Space Flight Center, Greenbelt, MD USA
The East Asian Jet Stream and Asian-Pacific-American Climate
Yang, Song, General Sciences Corp., USA; Lau, K.-M., NASA Goddard Space Flight Center, USA; Kim, K.-M., Universities Space Research Association, USA; [2000]; 6p; In English; 2nd; Ocean-Atmosphere, 10-12 Jul. 2000, Taipei, Taiwan, Province of China; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The upper-tropospheric westerly jet stream over subtropical East Asia and western Pacific, often referred to as East Asian Jet (EAJ), is an important atmospheric circulation system in the Asian-Pacific-American (APA) region during winter. It is characterized by variabilities on a wide range of time scales and exerts a strong impact on the weather and climate of the region. On the synoptic scale, the jet stream is closely linked to many phenomena such as cyclogenesis, frontogenesis, blocking, storm track activity, and the development of other atmospheric disturbances. On the seasonal time scale, the variation of the EAJ determines many characteristics of the seasonal transition of the atmospheric circulation especially over East Asia. The variabilities of the EAJ on these time scales have been relatively well documented. It has also been understood since decades ago that the interannual. variability of the EAJ is associated with many climate signals in the APA region. These signals include the persistent anomalies of the East Asian winter monsoon and the changes in diabatic heating and in the Hadley circulation. However, many questions remain for the year-to-year variabilities of the EAJ and their relation to the APA climate. For example, what is the relationship between the EAJ and El Nino/Southern Oscillation (ENSO)? Will the EAJ and ENSO play different roles in modulating the APA climate? How is the jet stream linked to the non-ENSO-related sea surface temperature (SST) anomalies and to the Pacific/North American (PNA) teleconnection pattern?
Author
Jet Streams (Meteorology); Asia; Climate; Variability; Teleconnections (Meteorology); Southern Oscillation; Sea Surface Temperature; Atmospheric Circulation

20000050469 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Impact of ENSO on Extratropical Low Frequency Noise in Seasonal Forecasts

Schubert, Siegfried D., NASA Goddard Space Flight Center, USA; Suarez, Max J., NASA Goddard Space Flight Center, USA; Chang, Yehui, NASA Goddard Space Flight Center, USA; Branstator, Grant, National Center for Atmospheric Research, USA; Feb. 29, 2000; 40p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study examines the uncertainty in forecasts of the January-February-March (JFM) mean extratropical circulation, and how that uncertainty is modulated by the El Nino/Southern Oscillation (ENSO). The analysis is based on ensembles of hindcasts made with an Atmospheric General Circulation Model (AGCM) forced with sea surface temperatures observed during; the 1983 El Nino and 1989 La Nina events. The AGCM produces pronounced interannual differences in the magnitude of the extratropical seasonal mean noise (intra-ensemble variability). The North Pacific, in particular, shows extensive regions where the 1989 seasonal mean noise kinetic energy (SKE), which is dominated by a ”PNA-like” spatial structure, is more than twice that of the 1983 forecasts. The larger SKE in 1989 is associated with a larger than normal barotropic conversion of kinetic energy from the mean Pacific jet to the seasonal mean noise. The generation of SKE due to sub-monthly transients also shows substantial interannual differences, though these are much smaller than the differences in the mean flow conversions. An analysis of the Generation of monthly mean noise kinetic energy (NIKE) and its variability suggests that the seasonal mean noise is predominantly a statistical residue of variability resulting from dynamical processes operating on monthly and shorter times scales. A stochastically-forced barotropic model (linearized about the AGCM’s 1983 and 1989 base states) is used to further assess the role of the basic state, submonthly transients, and tropical forcing, in modulating the uncertainties in the seasonal AGCM forecasts. When forced globally with spatially-white noise, the linear model generates much larger variance for the 1989 base state, consistent with the AGCM results. The extratropical variability for the 1989 base state is dominanted by a single eigenmode, and is strongly coupled with forcing over tropical western Pacific and the Indian Ocean, again consistent with the AGCM results. Linear calculations that include forcing from the AGCM variance of the tropical forcing and submonthly transients show a small impact on the variability over the Pacific/North American region compared with that of the base state differences.

Author

Research; Forecasting; Tropical Regions; Atmospheric General Circulation Models

20000050471 NASA Goddard Space Flight Center, Greenbelt, MD USA

On the Spatial Distribution of High Velocity Al-26 Near the Galactic Center

Sturner, Steven J., NASA Goddard Space Flight Center, USA; [2000]; 21p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We present results of simulations of the distribution of 1809 keV radiation from the decay of Al-26 in the Galaxy. Recent observations of this emission line using the Gamma Ray Imaging Spectrometer (GRIS) have indicated that the bulk of the AL-26 must have a velocity of approx. 500 km/ s. We have previously shown that a velocity this large could be maintained over the 10(exp 6) year lifetime of the Al-26 if it is trapped in dust grains that are reaccelerated periodically in the ISM. Here we investigate whether a dust grain velocity of approx. 500 km/ s will produce a distribution of 1809 keV emission in latitude that is consistent with the narrow distribution seen by COMPTEL. We find that dust grain velocities in the range 275 - 1000 km/ s are able to reproduce the COMPTEL 1809 keV emission maps reconstructed using the Richardson-Lucy and Maximum Entropy image reconstruction methods while the emission map reconstructed using the Multiresolution Regularized Expectation Maximization algorithm is not well fit by any of our models. The Al-26 production rate that is needed to reproduce the observed 1809 keV intensity yields in a Galactic mass of Al-26 of approx. 1.5 - 2 solar mass which is in good agreement with both other observations and theoretical production rates.

Author

Spatial Distribution; Aluminum Isotopes; Galaxies; Data Acquisition; Radiation Distribution; Simulation; Velocity Distribution

20000052205 NASA Goddard Space Flight Center, Greenbelt, MD USA

Environmental Forcing of Super Typhoon Paka’s (1997) Latent Heat Structure

Rodgers, Edward B., NASA Goddard Space Flight Center, USA; Olson, William, Maryland Univ. Baltimore County, USA; Halverson, Jeff, Maryland Univ. Baltimore County, USA; Simpson, Joanne, NASA Goddard Space Flight Center, USA; Pierce, Harold, Science and System Application, Inc., USA; October 1999; 69p; In English; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The distribution and intensity of total (i.e., combined stratified and convective processes) rainrate/latent heat release (LHR) were derived for tropical cyclone Paka during the period 9-21 December, 1997 from the F-10, F-11, F-13, and F-14 Defense Meteorological Satellite Special Sensor Microwave/Imager and the Tropical Rain Measurement Mission Microwave Imager observations. These observations were frequent enough to capture three episodes of inner core convective bursts that preceded periods

of rapid intensification and a convective rainband (CRB) cycle. During these periods of convective bursts, satellite sensors revealed that the rainrates/LHR: 1) increased within the inner eye wall region; 2) were mainly convectively generated (nearly a 65% contribution), 3) propagated inwards; 4) extended upwards within the middle and upper-troposphere, and 5) became electrically charged. These factors may have caused the eye wall region to become more buoyant within the middle and upper-troposphere, creating greater cyclonic angular momentum, and, thereby, warming the center and intensifying the system. Radiosonde measurements from Kwajalein Atoll and Guam, sea surface temperature observations, and the European Center for Medium Range Forecast analyses were used to examine the necessary and sufficient condition for initiating and maintaining these inner core convective bursts. For example, the necessary conditions such as the atmospheric thermodynamics (i.e., cold tropopause temperatures, moist troposphere, and warm SSTs [greater than 26 deg]) suggested that the atmosphere was ideal for Paka's maximum potential intensity (MPI) to approach super-typhoon strength. Further, Paka encountered weak vertical wind shear (less than 15 m/s) before interacting with the westerlies on 21 December. The sufficient conditions, on the other hand, appeared to have some influence on Paka's convective burst, but the horizontal moisture flux convergence values in the outer core were weaker than some of the previously examined tropical cyclones. Also, the upper tropospheric outflow generation of eddy relative angular momentum flux convergence was 4D much less than that found during moderate tropical cyclone/trough interaction. These results indicated how important the external necessary condition and the internal forcing (i.e., CRB cycle) were in generating Paka's convective bursts as compared to the external sufficient forcing mechanisms found in higher latitude tropical cyclones. Later, as Paka began to interact with the westerlies, both the necessary (i.e., strong vertical shear and colder SSTs) and sufficient (i.e., dry air intrusion) external forcing mechanisms helped to decrease Paka's rainrate.
Author
Atmospheric Circulation; Convection; Cyclones; Forecasting; Heat Transfer; Satellite Instruments

20000052466 NASA Goddard Space Flight Center, Greenbelt, MD USA
A New Raman Water Vapor Lidar Calibration Technique and Measurements in the Vicinity of Hurricane Bonnie
Evans, Keith D., Maryland Univ. Baltimore County, USA; Demoz, Belay B., Maryland Univ. Baltimore County, USA; Cadirola, Martin P., Maryland Univ. Baltimore County, USA; Melfi, S. H., Maryland Univ. Baltimore County, USA; Whiteman, David N., NASA Goddard Space Flight Center, USA; Schwemmer, Geary K., NASA Goddard Space Flight Center, USA; Starr, David OC., NASA Goddard Space Flight Center, USA; Schmidlin, F. J., NASA Wallops Flight Facility, USA; Feltz, Wayne, Wisconsin Univ., USA; [2000]; 7p; In English; 20th; Laser Radar, 10-14 Jul. 2000, Vichy, France; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The NAcA/Goddard Space Flight Center Scanning Raman Lidar has made measurements of water vapor and aerosols for almost ten years. Calibration of the water vapor data has typically been performed by comparison with another water vapor sensor such as radiosondes. We present a new method for water vapor calibration that only requires low clouds, and surface pressure and temperature measurements. A sensitivity study was performed and the cloud base algorithm agrees with the radiosonde calibration to within 10- 15%. Knowledge of the true atmospheric lapse rate is required to obtain more accurate cloud base temperatures. Analysis of water vapor and aerosol measurements made in the vicinity of Hurricane Bonnie are discussed.
Author
Technology Assessment; Optical Radar; Water Vapor; Calibrating; Radar Measurement; Hurricanes

20000052511 Naval Postgraduate School, Monterey, CA USA
Evaluation Study of the Tactical Atmospheric Modeling System/Real-Time (TAMS-RT) at NPMOC San Diego
Reiss, Arthur J.; Dec. 1999; 159p; In English
Report No.(s): AD-A375240; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The U.S. Navy is aggressively pursuing mesoscale atmospheric modeling. The Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) has been developed by the Naval Research Lab in Monterey, California to meet this task. A forecast system employing COAMPS, called the Tactical Atmospheric Mesoscale System-Real Time (TAMS-RT), is currently being field tested at two of the Navy's major regional weather facilities in Manama, Bahrain and San Diego, California. Mesoscale modeling is a complex process that requires detailed knowledge of mesoscale forcing and responses, as well as a capable data display system to make the best use of this new capability. While the challenge of interpretation of forecasts on the mesoscale has increased, the time available for producing forecasts has, if anything, decreased. Optimal methods of evaluation and display are needed that enable a forecaster to rapidly, yet skillfully complete this process. This thesis illustrates analysis techniques to aid in rapidly evaluating the utility of any given mesoscale forecast and proposes optimal methods for 3-D visualization and interpretation of various weather parameters. Using these techniques and methods, TAMS-RT performance is then evaluated for critical mesoscale weather

phenomena as defined by NPMOC San Diego, including the mesoscale weather effects associated with frontal passages and the Catalina Eddy.
DTIC
Mesoscale Phenomena; Mesometeorology; Air Water Interactions; Atmospheric Models; Prediction Analysis Techniques; Weather Forecasting

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OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

20000045703 National Inst. for Resources and Environment, Ibaraki, Japan
Water Column Inventories of Chlorofluorocarbons and Production Rate of Intermediate Water in the North Pacific
Watanabe, Y. W., National Inst. for Resources and Environment, Japan; Ishida, A., Kansai Environmental Engineering Center Co. Ltd., Japan; Tamaki, M., Tokai Univ., Japan; Okuda, K., National Research Inst. of Fisheries Science, Japan; The School of Marine Science and Technology, Tokai University: Collected Reprints for the Years 1996-1997; February 1998; ISSN 0389-2050; Volume 27, pp. 175-188; Repr. from Deep-Sea Research 1(Elsevier Science Ltd.), v. 44, no. 7, 1997 p 1091-1104; In English
Report No.(s): Contribution-B-555; Copyright; Avail: Issuing Activity

A cross-section of chlorofluorocarbons (CFCs) in the North Pacific was obtained along 30 N in 1994. Distributions of water column inventories of CFCs in the North Pacific were estimated by interpolating observed concentrations of CFCs to all the North Pacific based on salinity and water temperature. Total amounts of CFC-11 and CFC-12 in the North Pacific were estimated to be 7.92 plus or minus 1.17 (x 10 (exp 7) moles) and 4.55 plus or minus 0.73 (x 10 (exp 7) moles), respectively. by introducing the CFCs data into a four-box model for the North Pacific, relations between an exchange coefficient of CFC and a production rate of intermediate water in the North Pacific were estimated. The production rate of intermediate water was calculated to be 24 plus or minus 4 Sv by assuming the exchange coefficient of CFC to be large enough due to the surface concentration of CFC to be saturated rapidly.
Author
Chlorofluorocarbons; Pacific Ocean; Water Depth; Inventories; Sea Water

20000045706 Tokai Univ., School of Marine Science and Technology, Shimizu, Japan
Oceanography as a Precise Branch of Scientific Study
Segawa, Jiro, Tokai Univ., Japan; The School of Marine Science and Technology, Tokai University: Collected Reprints for the Years 1996-1997; February 1998; ISSN 0389-2050; Volume 27, pp. 19-31; In Japanese, 19 Sep. 1996, Japan
Report No.(s): Contribution-B-546; Copyright; Avail: Issuing Activity

Oceanography which was previously regarded as a rough science is being innovated to become a precision science, thanks to the radical progress in technology of the ocean researches. The most important innovation in marine science is the improvement of marine positioning, the advance of diving technique, the advance of materials used for the marine surveys and the space technology for the global observations. Some examples of recent results of researches conducted by the authors using the advanced observation technology are described.
Author
Oceanography; Marine Environments; Aerospace Engineering

20000045729 Hawaii Univ., Center for Tropical and Subtropical Aquaculture, Honolulu, HI USA
Culture of Soft Corals (Order: Alcyonacea) for the Marine Aquarium Trade
Ellis, S.; Sharron, L.; 1999; 84p; In English; Original contains color illustrations
Contract(s)/Grant(s): USDA-97-3850-0-4042; DI-TR-98-05
Report No.(s): PB2000-103227; CTSA-PUB-137; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

There are currently many excellent books and articles about the biology and husbandry of soft corals as aquarium specimens. However, the literature on artificial propagation or culture of these animals, especially on a large scale, is scant or lacking. The purpose of this manual is to provide a step-by-step guide to soft coral farming for potential farmers throughout the tropical Indo-

Pacific region. Biology and culture techniques are provided mainly for soft corals that have shown culture potential and therefore the text may not extensively cover all members of the soft coral group.
NTIS
Culture Techniques; Tropical Regions; Coral Reefs; Activity (Biology)

20000048488 Naval Postgraduate School, Monterey, CA USA
A Comparison of Output From The Los Alamos National Laboratory (LANL) Parallel Ocean Program (POP) Model With Surface Velocity Data From Drifting Buoys in the North Atlantic Ocean
Pelton, Jimmy W.; Mar. 2000; 155p; In English
Report No.(s): AD-A375844; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Surface velocity fields from two configurations of the Los Alamos National Laboratory (LANL) Parallel Ocean Program (POP) model are compared to surface velocity data from satellite-tracked buoys in the North Atlantic. Separate analyses are conducted for each model configuration. In the first analysis, output from a 1/6-degree, 20-level model version is compared with five years (1993-1997) of drifter data, based on both Eulerian and Lagrangian statistics. In the second analysis, newly-available output from a 1/10-degree, 40 level version is compared to a two-year subset (1993-1994) of the data, and to 1/6-degree output over the same time frame. The latter comparison is based on Eulerian statistics alone. The five-year comparison shows that the 1/6-degree model produces inaccuracies in some features, and generally underestimates velocity variance. Modeled Lagrangian time scales are too long, while the length scales are too short. The two-year comparison shows that at the higher vertical and horizontal resolution of the 1/10-degree model, there is a striking improvement in the spatial distribution of energy and resolution of the variance field.
DTIC
Ocean Models; Atlantic Ocean; Spatial Distribution; Ocean Surface

20000048490 New Hampshire Univ., Durham, NH USA
Mesoscale Structure of Zooplankton in the California Current ***Final Report, 1 Jan. 1998-31 Dec. 1999***
Bucklin, Ann; Olson, Donald B.; Wiebe, Peter H.; Dec. 31, 1999; 9p; In English; Additional contract, N00014-96-1-0268(WHOI). Prepared in cooperation with the University of Miami, Miami, FL and Woods Hole Oceanographic Institution, Woods Hole, MA.
Contract(s)/Grant(s): N00014-96-1-0302(UNH); N00014-96-1-0421(RSMAS)
Report No.(s): AD-A375832; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This collaborative project was designed to improve our quantitative understanding and predicative abilities for zooplankton population dynamics, especially at the boundaries of distributions, through the use of specifically designed field efforts utilizing bio-acoustics, biochemical and molecular analyses, and process models. Nematoscelis difficilis (Crustacea, Euphausiacea) were collected in a persistent, eutrophic coastal eddy and in oligotrophic offshore waters of the California Current. The euphausiids were assayed for biochemical and molecular genetic traits. Kinetic assays of enzyme concentrations for phosphoglucose isomerase (PGI), lactate dehydrogenase (LDH), citrate synthase (CS), and hexokinase (HK) were used to infer physiological adaptation. DNA sequence variation of the genes encoding PGI and LDH were used to estimate allele and genotype frequencies, and to infer selective mortality. DNA sequence variation of a 350 base-pair region of mitochondrial cytochrome oxidase I (mtCOI) revealed significant sample-to-sample heterogeneity; two groups of samples - coastal and offshore - were differentiated by mtCOI haplotype frequencies, suggesting that N. difficilis collected in the two regions may have originated from distinct sources. Concentrations of PGI and LDH were higher in individuals from the cool, rich near-shore waters. Genotype frequencies of the genes encoding these enzymes did not differ between samples or domains, suggesting that the patterns were not the result of direct selection on the traits assayed. This study provided evidence that N. difficilis individuals responded to mesoscale variability by physiological adaptation, not by differential mortality and selection. Bio-acoustical backscatter showed dramatic day-night differences along the offshore portion of the transect as well as clear vertical stratification.
DTIC
Marine Biology; Bioacoustics; Zooplankton; Mesoscale Phenomena; Arthropods; Biochemistry; Hexokinase

20000050208 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Active and Passive Microwave Determination of the Circulation and Characteristics of Weddell and Ross Sea Ice
Drinkwater, Mark R., Jet Propulsion Lab., California Inst. of Tech., USA; Liu, Xiang, Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 3p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A combination of satellite microwave data sets are used in conjunction with ECMWF (Medium Range Weather Forecasts) and NCEP (National Center for Environment Prediction) meteorological analysis fields to investigate seasonal variability in the circulation and sea-ice dynamics of the Weddell and Ross Seas. Results of sea-ice tracking using SSM/I (Special Sensor Micro-

wave Imager), Scatterometer and SAR images are combined with in-situ data derived from ARGOS buoys and GPS drifters to validate observed drift patterns. Seasonal 3-month climatologies of ice motion and drift speed variance illustrate the response of the sea-ice system to seasonal forcing. A melt-detection algorithm is used to track the onset of seasonal melt, and to determine the extent and duration of atmospherically-led surface melting during austral summer. Results show that wind-driven drift regulates the seasonal distribution and characteristics of sea-ice and the intensity of the cyclonic Gyre circulation in these two regions.
Author
Annual Variations; Meteorological Parameters; Microwave Imagery; Remote Sensing; Water Circulation; Sea Ice; ARGOS System

20000052128 Princeton Univ., Dept. of Physics, NJ USA
Triboluminescence and Light at Deep Sea Hydrothermal Vents
Reynolds, George T.; Mar. 28, 2000; 15p; In English
Contract(s)/Grant(s): N00014-00-1-0010; Proj-00PR00102-00
Report No.(s): AD-A375876; PHYS-2; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Triboluminescence has been well known for many minerals when fractured. Samples of minerals found in vent chimneys and plumes were fractured & the light recorded by means of a photomultiplier. Light was also observed when a sample of small particles in a beaker of water was stirred, indicating that these minerals may emit light in a turbulent vent plume.
DTIC
Triboluminescence; Tribology

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see categories 52 through 55.

20000044897 Rutherford Appleton Lab., Chilton, UK
Structure of Immunoglobulin A, a Biological Macromolecule
Perkins, S. J., University Coll., UK; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 46-47; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Antibody or immunoglobulin molecules play a critical role in our body's immune defense against bacteria and viruses. Immunoglobulin A (IgA) is not only present in blood but is also the predominant antibody class found in the mucosal surfaces of the lung and the gastrointestinal tracts, so forms a critical first line of defence against many invading pathogens. However, despite the abundance and importance of IgA, surprisingly little is known about the three-dimensional structures of the different IgA forms and how these relate to their unique roles in immunity. Small-angle diffraction using neutrons or X-rays is an ideal means to determine their solution structures; measurements on LOQ are helping to reveal the intermolecular arrangement and this in turn provides a better understanding of IgA's functional properties.
Author
Antibodies; Immune Systems; Immunology; Bacteria; Viruses; Antigens

52
AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science. For the effects of space on animals and plants see 51 Life Sciences.

20000045690 NASA Johnson Space Center, Houston, TX USA
Endothelium Preserving Microwave Treatment for Atherosclerosis
Carl, James R., Inventor, NASA Johnson Space Center, USA; Arndt, G. Dickey, Inventor, NASA Johnson Space Center, USA; Fink, Patrick W., Inventor, NASA Johnson Space Center, USA; Beer, N. Reginald, Inventor, NASA Johnson Space Center, USA; Henry, Phillip D., Inventor, NASA Johnson Space Center, USA; Pacifico, Antonio, Inventor, NASA Johnson Space Center, USA; Raffoul, George W., Inventor, NASA Johnson Space Center, USA; Apr. 04, 2000; 24p; In English; Continuation-in-part of US-

Patent-Appl-SN-641045, filed 17 Apr. 1996
Patent Info.: Filed 5 Aug. 1998; NASA-Case-MSC-22724-1; US-Patent-6,047,216; US-Patent-Appl-SN-129832; US-Patent-Appl-SN-641045; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Method and apparatus are provided to treat atherosclerosis wherein the artery is partially closed by dilating the artery while preserving the vital and sensitive endothelial layer thereof Microwave energy having a frequency from 3 GHz to 300 GHz is propagated into the arterial wall to produce a desired temperature profile therein at tissue depths sufficient for thermally necrosing connective tissue and softening fatty and waxy plaque while limiting heating of surrounding tissues including the endothelial laser and/or other healthy tissue, organs, and blood. The heating period for raising the temperature a potentially desired amount, about 20 C., within the atherosclerotic lesion may be less than about one second. In one embodiment of the invention, a radically beveled waveguide antenna is used to deliver microwave energy at frequencies from 25 GHz or 30 GHz to about 300 GHz and is focused towards a particular radial sector of the artery. Because the atherosclerotic lesions are often asymmetrically disposed, directable of focussed heating preserves healthy sectors of the artery and applies energy to the asymmetrically positioned lesion faster than a non-directed beam. A computer simulation predicts isothermic temperature profiles for the given conditions and man be used in selecting power, pulse duration, beam width, and frequency of operation to maximize energy deposition and control heat rise within the atherosclerotic lesion without harming healthy tissues or the sensitive endothelium cells.
Official Gazette of the U.S. Patent and Trademark Office
Arteriosclerosis; Microwave Frequencies; Endothelium; Softening; Sensitivity; Pulse Duration; Heating; Energy Transfer; Computerized Simulation; Clinical Medicine

20000045712 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
Handbook of Airsickness for the Canadian Forces Air Navigation School (CFANS)
Cheung, B., Defence and Civil Inst. of Environmental Medicine, Canada; Jan. 2000; 34p; In English
Report No.(s): AD-A375321; DCIEM-TR-2000-014; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Airsickness is a common occurrence among aircrew trainees, particularly during the initial training phase. It is well known that motion sickness afflicts the passenger far more than the driver of the vehicle. The objectives of this handbook are to assist student-navigators to dispel myths about airsickness, to recognize the mechanism of airsickness during their initial training, to provide some practical countermeasures and to propose future training strategies in order to minimize the impact of airsickness on operation. Although this handbook is written specifically for CFANS and the investigation into the specific cause of airsickness in navigators is based on the CT-142, other CF navigators, aircrew and flight surgeons may find some of the information useful as well.
DTIC
Motion Sickness; Aerospace Medicine

20000048263 NASA Johnson Space Center, Houston, TX USA
Tubular Coupling
Rosenbaum, Bernard J., Inventor, NASA Johnson Space Center, USA; Apr. 18, 2000; 6p; In English
Patent Info.: Filed 21 Sep. 1998; NASA-Case-MSC-22865-1; US-Patent-6,050,987; US-Patent-Appl-SN-157759; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A system for coupling a vascular overflow graft or cannula to a heart pump. A pump pipe outlet is provided with an external tapered surface which receives the end of a compressible connula. An annular compression ring with a tapered internal bore surface is arranged about the cannula with the tapered internal surface in a facing relationship to the external tapered surface. The angle of inclination of the tapered surfaces is converging such that the spacing between the tapered surfaces decreases from one end of the external tapered surface to the other end thereby providing a clamping action of the tapered surface on a cannula which increases as a function of the length of cannula segment between the tapered surfaces. The annular compression ring is disposed within a tubular locking nut which threadedly couples to the pump and provides a compression force for urging the annular ring onto the cannula between the tapered surfaces. The nut has a threaded connection to the pump body. The threaded coupling to the pump body provides a compression force for the annular ring. The annular ring has an annular enclosure space in which excess cannula material from the compression between the tapered surfaces to ”bunch up” in the space and serve as an enlarged annular ring segment to assist holding the cannula in place. The clamped cannula provides a seamless joint connection to the pump pipe outlet where the clamping force is uniformly applied to the cannula because of self alignment of the tapered surfaces. The nut can be easily disconnected to replace the pump if necessary.
Official Gazette of the U.S. Patent and Trademark Office
Cardiovascular System; Cannulae; Clamps; Couples; Heart; Joints (Junctions); Self Alignment

20000048494 National Bioethics Advisory Commission, Rockville, MD USA

Research Involving Human Biological Materials: Ethical Issues and Policy Guidance, Volume 2, Commissioned Papers

Jan. 2000; 260p; In English

Report No.(s): PB2000-104235; No Copyright; Avail: CASI; A03, Microfiche; A12, Hardcopy

Content include the following: Privacy and the Analysis of Stored Tissues; An Ethical Framework for Biological Samples Policy; Research on Human Tissue: Religion Perspectives; Stored Tissue Samples: An Inventory of Sources in the USA; Contribution of the Human Tissue Archive to the Advancement of Medical Knowledge and the Public Health; The Ongoing Debate About Stored Tissue Samples; and Mini-Hearings on Tissue Samples and Informed Consent.

NTIS

Research; Policies; Genetic Engineering; Research Management; Public Health

20000048498 Center for Mathematics and Computer Science, Amsterdam, Netherlands

Mathematical Modelling in Blood Coagulation; Simulation and Parameter Estimation. Modelling, Analysis and Simulation

Stortelder, W. J. H., Center for Mathematics and Computer Science, Netherlands; Hemker, P. W., Center for Mathematics and Computer Science, Netherlands; Hemker, H. C., Center for Mathematics and Computer Science, Netherlands; Sep. 1997; 20p; In English

Report No.(s): PB2000-104702; MAS-R9720; Copyright; Avail: National Technical Information Service (NTIS)

This paper describes the mathematical modelling of a part of the blood coagulation mechanism. The model includes the activation of factor X by a purified enzyme from Russel's Viper Venom (RVV), factor V and prothrombin, and also comprises the inactivation of the products formed. In this study the authors assume that in principle the mechanism of the process is known. However, the exact structure of the mechanism is unknown, and the process still can be described by different mathematical models. These models are put to the test by measuring their capacity to explain the course of thrombin generation as observed in plasma after recalcification in presence of RVV. The mechanism studied is mathematically modelled as a system of differential-algebraic equations (DAEs). Each candidate model contains some freedom, which is expressed in the model equations by the presence of unknown parameters. For example, reaction constants or initial concentrations are unknown. The goal of parameter estimation is to determine these unknown parameters in such a way that the theoretical (i.e., computed) results fit the experimental data within measurement accuracy and to judge which modifications of the chemical reaction scheme allow the best fit. The authors present results on model discrimination and estimation constants, which are hard to obtain in another way.

NTIS

Mathematical Models; Blood Coagulation; Simulation; Chemical Reactions; Numerical Analysis

20000048617 Army Research Inst. of Environmental Medicine, Natick, MA USA

Thermoregulatory and Immune Responses During Cold Exposure: Effects of Repeated Cold Exposure and Acute Exercise

Castellani, John W.; Young, Andrew J.; Sawka, Michael N.; Shek, Pang N.; Brenner, Ingrid K.; Mar. 2000; 105p; In English; Prepared in collaboration with the Defence and Civil Institute of Environmental Medicine, Toronto, Canada.

Report No.(s): AD-A375860; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Whether or not the thermoregulatory system fatigues (i.e., causes blunted shivering thermogenesis and vasoconstriction) during cold exposure is unknown. Thus, a series of experiments were executed to determine if serial cold water immersion or acute exertional fatigue would cause thermoregulatory fatigue during subsequent cold exposure. This information will be used in developing thermoregulatory models during cold exposure. During these studies several unanswered questions regarding thermoregulation in the cold were also addressed: (1) do thermoregulatory responses to cold show fatigue when prolonged cold water exposures are serially repeated? (2) are thermoregulatory effector responses to cold affected by time of day? (i.e., circadian influences); (3) does a single acute, fatiguing exercise bout impair thermoregulatory responses to subsequent cold exposure? and (4) does fatigue induced by severely strenuous physical activity compromise the immune response to cold exposure? The results of these studies suggest that: (1) serial cold water blunts shivering leading to lower core temperatures, (2) thermoregulatory effector responses are not affected by time of day, (3) exercise increases peripheral heat loss and lowers core temperature during subsequent cold exposure, and (4) that acute cold exposure has immununostimulating effects.

DTIC

Temperature Control; Exposure; Physiological Responses; Thermoregulation; Water Immersion; Shivering

20000052125 Civil Aeromedical Inst., Oklahoma City, OK USA

The Evaluation of In-Flight Medical Care Aboard Selected US Air Carriers: 1996 to 1997 ***Final Report***

Dejohn, Charles A., Civil Aeromedical Inst., USA; Veronneau, Stephen J. H., Civil Aeromedical Inst., USA; Wolbrink, Alex M., Civil Aeromedical Inst., USA; Larcher, Julie G., Civil Aeromedical Inst., USA; Smith, David W., Oklahoma Univ., USA; Garrett, Joan, MedAire, Inc., USA; May 2000; 32p; In English

Contract(s)/Grant(s): DTFA02-97-P-53665; AM-B-97-TOX-203

Report No.(s): DOT/FAA/AM-00/13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Medical care in-flight and the FAA-mandated medical kit have been studied for many years. This study includes a detailed correlation between in-flight medical care, patient response in-flight, and post-flight follow-up, in an effort to evaluate in-flight medical care delivery on US airlines and re-evaluate the FAA-mandated in-flight medical kit. A survey of five US domestic air carriers from October 1, 1996, to September 30, 1997, showed 1132 in-flight medical incidents. These airlines accounted for approximately 22% of scheduled US domestic enplanements during the period. There was good overall agreement between in-flight and post-flight diagnoses (70% of cases), and passenger condition improved in a majority of cases (60%), suggesting that in-flight diagnoses were generally accurate and treatment was appropriate. Results indicated that bronchodilator inhalers, oral antihistamines, and non-narcotic analgesics, all of which were obtained from other passengers, were used frequently enough to support a suggestion to include them in the medical kit.

Author

Airline Operations; Air Transportation; In-Flight Monitoring; Crew Procedures (Inflight); Medical Services

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also 16 Space Transportation and 52 Aerospace Medicine..

20000046610 Ljubljana Univ., Fakulteta za Elektrotehniko, Ljubljana, Slovenia

Time Optimal Control of Batch Phases in Biological Wastewater Treatment ***Casovno Optimalno Vodenje Zakljucevanja faz Biotehnoloskega Sarznega Procesa***

Pavselj, Natasa, Ljubljana Univ., Slovenia; Hvala, Nadja, Jozef Stefan Inst., Slovenia; Kocijan, Jus, Ljubljana Univ., Slovenia; Ros, Milenko, Kemijski Institut, Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 1, pp. 9-15; In Slovak; Copyright; Avail: Issuing Activity

This paper is concerned with control of a sequencing batch reactor (SBR) for wastewater treatment. Compared to continuous processes, this batch reactor is characterised by a more stable process operation, but requires a higher level of process control and automation. An important problem in the operation of SBR is on-line control of batch phases duration. This control function should be applied due to the variable input load which requires an adjustment of phase duration for each batch. In this way, each phase is terminated when corresponding biological reactions are completed. It is expected that such a control strategy improves the quality of the treated water and minimises the energy consumption due to the shortening of the aerobic phase. An obstacle for the application of this control function is the lack of on-line data for following the course of biodegradation processes during the batch. Measurements of wastewater components that are crucial for termination of batch phases are usually performed only by laboratory analyses as sensors in this area are often very expensive or not available at all. Sometimes they are not very reliable or have a too great l and are thus not appropriate for on-line control. to overcome this problem, the control strategy in this paper is based on some simple indirect process measurements that could be related to the course of biodegradation processes. Namely, laboratory experiments have shown that on-line measurements of the dissolved oxygen concentration, redox potential and pH contain some characteristic patterns that indicate the end of biodegradation processes. In particular, the dissolved oxygen break-point could be used to define the termination time of the aerobic phase, while nitrate knee is used to detect the end algorithm is based on heuristic rules that act on the derivative of filtered signals. The proposed control procedure was tested on a laboratory pilot plant supported by an experimental computer supported environment. The environment is designed in such a way that the control algorithms designed in the MATLAB package could be immediately applied and tested on the pilot plant. On-line testing of the proposed procedure, supported by laboratory measurements, showed a good agreement of the computed times for the termination of batch phases with those corresponding to the actual termination of biodegradation processes.

Author

Time Optimal Control; Waste Water; Water Treatment; Sequencing; Biodegradation; Algorithms

20000048257 NASA Johnson Space Center, Houston, TX USA

Skin Temperatures During Unaided Egress: Unsuited and While Wearing the NASA Launch and Entry or Advanced Crew Escape Suits

Woodruff, Kristin K., Wyle Labs., Inc., USA; Lee, Stuart M. C., Wyle Labs., Inc., USA; Greenisen, Michael C., NASA Johnson Space Center, USA; Schneider, Suzanne M., NASA Johnson Space Center, USA; March 2000; 44p; In English

Report No.(s): NASA/TM-2000-209761; NAS 1.15:209761; S-853; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The two flight suits currently worn by crew members during Shuttle launch and landing, the Launch and Entry Suit (LES) and the Advanced Crew Escape Suit (ACES), are designed to protect crew members in the case of emergency. Although the Liquid Cooling Garment (LCG) worn under the flight suits was designed to counteract the heat storage of the suits, the suits may increase thermal stress and limit the astronaut's egress capabilities. The purpose of this study was to assess the thermal loads experienced by crew members during a simulated emergency egress before and after spaceflight. Comparisons of skin temperatures were made between the preflight unsuited and suited conditions. between the pre- and postflight suited conditions, and between the two flight suits.

Author

Egress; Garments; Heat Storage; Liquid Cooling; Thermal Stresses; Performance Tests

20000048388 Maryland Univ., College Park, MD USA

Design of a Power-Assisted Spacesuit Glove Actuator

Howard, Russell D., Maryland Univ., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 89-102; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper presents the details of the design and implementation of an electromechanical power-assisted spacesuit glove actuator. The project was a joint effort by the University of Maryland's Space Systems Laboratory and ILC Dover, Inc., and involved innovative approaches to power augmentation and compact actuator packaging. The first actuator built validated several basic design concepts, and the second demonstrated improved performance and met many of the goals for flight qualification of the technology.

Author

Design Analysis; Electromechanical Devices; Space Suits; Gloves; Actuators

20000048615 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Development of the U.S. Navy Advanced Personal Air Conditioning System (APACS)

Kaufman, Jonathan; Jan. 1999; 6p; In English

Report No.(s): AD-A375855; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes the technology behind the development of the USN APACS man-mounted cooling system, a key component of HAILSS. APACS represents a lightweight, man-mounted cooling system for aircrews requiring no airframe modifications. This system is suitable for all crew stations and can be used during preflight inspections or by nonflying personnel.

DTIC

Cooling; Air Conditioning Equipment; Protective Clothing; Technology Assessment

20000048822 Aeronautical Systems Div., Directorate of Flight Systems Engineering, Wright-Patterson AFB, OH USA

B-1B Human Factors Baseline Study Report ***Final Report, 1 Mar. - 31 Oct. 1999***

Kalman, William G.; Kline, Jane M.; Provost, Scott; Gable, Beverly A.; Taylor, Christopher R.; Nov. 1999; 101p; In English

Report No.(s): AD-A375841; ASC-TR-1999-5007; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

A Human Factors study was conducted on B-1B Blocks D, E, and F. The 1st study objective was to evaluate B-1B Blocks D, E, and F crew workload and situational awareness. The 2nd objective was to establish a measurable crew performance baseline for future B-1B Block upgrades. These objectives were studied in the B-1B Engineering Research Simulator (ERS) in a simulated full mission environment using eight B-1B crews. After training, the crews flew two missions. Workload and situational awareness were measured, a questionnaire was given, and all missions were video taped. Human Factors improvements were recommended.

DTIC

Human Factors Engineering; Human Performance

20000052258 Naval Aerospace Medical Research Lab., Pensacola, FL USA
Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) Summary
Bransdorfer, A. H.; Johnson, K. R.; Dec. 22, 1999; 22p; In English
Contract(s)/Grant(s): Proj-
Report No.(s): AD-A375339; NAMRL-TM-99-01; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Aviation life support systems (ALSS) equipment is a critical and essential component for mission success in naval aviation. Anecdotal comments by naval aircrews have indicated that ALSS equipment is perceived as ill-fitting and substandard. Additionally, many aircrews in naval aviation are not satisfied with current urine collection devices (UCDs). The Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) survey was completed by 2,055 U.S. Navy and Marine Corps aircrew. The sample population included 85 women and 1,970 men. According to the survey results, ALSS equipment appears to fit slightly better than ”ok” in all but the anti-exposure suit. The overall performance of current ALSS was rated slightly above the median with the exception of the anti-exposure suit (rated below the median). Aircrews identified the flight suit as the number-one priority with respect to safety, thermal protection, and comfort. The helmet was identified as the number one priority item with respect to survivability. The majority of the sampled aircrew has required the use of urine collection devices (UCDs) during flight. These aircrews selected the piddle pack and relief tube as moderately acceptable solutions for urination during flight.
DTIC
Flight Crews; Human Beings; Medical Equipment; Urine

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see categories 60 through 67.

20000045135 bd Systems, Inc., GN and C Group, Huntsville, AL USA
Mathematical Model Development and Simulation Support ***Final Report, Nov. 1995 - Apr. 2000***
Francis, Ronald C., bd Systems, Inc., USA; Tobbe, Patrick A., bd Systems, Inc., USA; Apr. 30, 2000; 336p; In English
Contract(s)/Grant(s): NAS8-40604
Report No.(s): TCD20000103A; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

This report summarizes the work performed in support of the Contact Dynamics 6DOF Facility and the Flight Robotics Lab at NASA/ MSFC in the areas of Mathematical Model Development and Simulation Support.
Author
Mathematical Models; Simulation; Robotics; Hydraulic Control

20000047450 Department of Energy, Office of Financial Management and Controller, Washington, DC USA
Numerical performance of wavelets and reproducing kernels for PDE’s
Christon, M. A.; Roach, D. W.; Voth, T. E.; Dec. 31, 1998; 8p; In English; Computational engineering science, 1998
Report No.(s): DE98-007160; SAND-98-0107C; No Copyright; Avail: Department of Energy Information Bridge

The results presented here constitute a brief summary of an on-going multi-year effort to investigate hierarchical/wavelet bases for solving PDE’s and establish a rigorous foundation for these methods. A new, hierarchical, wavelet-Galerkin solution strategy based upon the Donovan-Geronimo-Hardin-Massopust (DGHM) compactly-supported multi-wavelet is presented for elliptic partial differential equations. This multi-scale wavelet-Galerkin method uses a wavelet transform to yield nearly mesh independent condition numbers for elliptic problems as opposed to the multi-scaling functions that yield condition numbers which increase as the square of the mesh size. In addition, the results of von Neumann analyses for the DGHM multi-wavelet element and the Reproducing Kernel Particle Method (RKPM) are presented for model hyperbolic partial differential equations. RKPM exhibits excellent dispersion characteristics using a consistent mass matrix with the proper choice of refinement parameter and mass matrix formulation. In comparison, the wavelet-Galerkin formulation using the DGHM element delivers a frequency response comparable to a Bubnov-Galerkin formulation with a quadratic element.
NTIS
Wavelet Analysis; Kernel Functions

20000050215 Department of Energy, Office of Energy Research, Washington, DC USA
Bayesian approach to extracting meaning from system behavior
Dress, W. B.; Dec. 31, 1998; 9p; In English; 1998 IEEE international conference on systems, man and cybernetics
Report No.(s): DE98-007185; ORNL/CP-98644; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The modeling relation and its reformulation to include the semiotic hierarchy is essential for the understanding, control, and successful re-creation of natural systems. This presentation will argue for a careful application of Rosen's modeling relationship to the problems of intelligence and autonomy in natural and artificial systems. to this end, the authors discuss the essential need for a correct theory of induction, learning, and probability; and suggest that modern Bayesian probability theory, developed by Cox, Jaynes, and others, can adequately meet such demands, especially on the operational level of extracting meaning from observations. The methods of Bayesian and maximum Entropy parameter estimation have been applied to measurements of system observables to directly infer the underlying differential equations generating system behavior. This approach by-passes the usual method of parameter estimation based on assuming a functional form for the observable and then estimating the parameters that would lead to the particular observed behavior. The computational savings is great since only location parameters enter into the maximum-entropy calculations; this innovation finesses the need for nonlinear parameters altogether. Such an approach more directly extracts the semantics inherent in a given system by going to the root of system meaning as expressed by abstract form or shape, rather than in syntactic particulars, such as signal amplitude and phase. Examples will be shown how the form of a system can be followed while ignoring unnecessary details. In this sense, the authors are observing the meaning of the words rather than being concerned with their particular expression or language. For the present discussion, empirical models are embodied by the differential equations underlying, producing, or describing the behavior of a process as measured or tracked by a particular variable set--the observables. The a priori models are probability structures that capture syntactical relationships within the formal system that mirrors the natural system under observation. Inductive learning is then a prescription for incorporating the current, and possibly changing, empirical model into an iterative syntactical relationship in the form of a statement about parameters, producing an updated a priori model subject to future modification in the light of changing parameter sets.
NTIS
Bayes Theorem; Artificial Intelligence

20000050364 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Continuity of Convex Cores with Respect to the Geometric Topology
Ohshika, K.; Dec. 1999; 48p
Report No.(s): PB2000-103805; IHES/M/99/93; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

No abstract available.
NTIS
Convexity; Cores

20000050365 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Local and Global in Geometry
Gromov, M.; Dec. 1999; 20p
Report No.(s): PB2000-103804; IHES/M/99/96; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In geometry, the locality comes under the name of the 'local-to-global principles'. Start with the notion of the length of a curve in space. If we divide a curve into small pieces, we can recapture the global length by just adding the lengths of these pieces, where the pieces can be microscopically (or infinitesimally, as mathematicians say) small. Thus the familiar notion of length incorporates the local-to-global principle. Next, imagine the curve moves in space and we record the positions of points on the curve at different moments. If the curve is represented by a thin string made of elastic rubber the length does not have to be preserved: two very close points on the curve may come closer or further apart than they originally were. On the other hand, if we think of a flexible thread that can be bent but not stretched or compressed, then the distance in space between infinitesimally close points remains constant in so far as the curve remains smooth, i.e. does not develop creases.
NTIS
Geometry; Threads; Strings

20000050366 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Deformations of Algebras over Operads and Deligne's Conjecture
Kontsevich, M.; Soibelman, Y.; Feb. 2000; 74p
Report No.(s): PB2000-103801; IHES/M/00/09; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The paper is organized in the following way. Section 1 is devoted to the review of operads. It includes a brief introduction to operads, language of trees, polynomial functors etc. The deformation theory of algebras over free operads is discussed in Section 2. In Section 3 we outline the strategy and state the theorem (proved in Section 6) which explain why the GT group appears in the deformation theory of associative algebras. Our approach is based on the notion of a free resolution of an operad. This is the subject o Section 4. In Section 5 we construct an operad M which acts on the Hochschild complex of an A-infinity-algebra. It turns out that M is closely related to the compactifications of configuration spaces of point introduced by Fulton and Macpherson in (FM). Section 6 is devoted to the proof of the theorem from Section 3. Section 7 is devoted to Deligne's conjecture and its proof.
NTIS
Algebra; Deformation; Operators (Mathematics)

20000051484 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Roth's Theorem for Ruled Surfaces
Gasbarri, C.; McQuillan, M.; Dec. 1999; 22p
Report No.(s): PB2000-103807; IHES/M/99/89; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper addresses conjectures of E. Bombierei and P. Vojta in the special case of ruled surfacs not birational to P2. Apart from this implicit restriction to P1 bundles S over an elliptic curve, the ultimate question of the arithmetic of pairs (S,D) for a divisor D requires further restrictions on D which turn the proposed conjectures into the study of Roth's theorem on approximation of algebraic numbers alpha, but for alpha now parametrized by an elliptic curve. With these restrictions, best possible answers are obtained. The same study may also be carried out for holomrophic maps, and this is done simultaneously.
NTIS
Theorems; Algebra; Bundles

20000052497 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
[Research Conducted at the Institute for Computer Applications in Science and Engineering for the Period October 1, 1999 through March 31, 2000] ***Semiannual Report, 1 Oct. 1999 - 31 Mar. 2000***
April 2000; 49p; In English
Contract(s)/Grant(s): NAS1-97046; NAS1-19480; NAS1-18605; NAS1-18107; NAS1-17070; NAS1-17130; NAS1-15810; NAS1-163-94; NAS1-14101; NAS1-14472; RTOP 505-90-52-01
Report No.(s): NASA/CR-2000-210105; NAS 1.26:210105; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report summarizes research conducted at the Institute for Computer Applications in Science and Engineering in applied mathematics, computer science, fluid mechanics, and structures and materials during the period October 1, 1999 through March 31, 2000.
Derived from text
Multidisciplinary Design Optimization; Fluid Mechanics; Research; Acoustics; Computer Techniques; Software Engineering; Applications of Mathematics

20000052505 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Open Set Conditions for Infinite Conformal IFS
Mauldin, R. D.; Solomyak, B.; Urbanski, M.; Feb. 2000; 16p; In English
Contract(s)/Grant(s): NSF DMS-98-00786; NSF DMS-98-01583
Report No.(s): PB2000-103800; IHES/M/00/10; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The authors consider infinite conformal iterated systems. Extending the results from (Sc) and (PRSS) the authors demonstrate that in this case the open set condition with the cone property implies the strong open set condition. Completing a theorem from (MU), the authors then apply this result to show positivity of an appropriate packing measure.
NTIS
Theorems; Cones

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see 33 Electronics and Electrical Engineering. For computer vision see 63 Cybernetics, Artificial Intelligence and Robotics.

20000052473 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Towards a Customizable PVS *Final Report*
Luettgen, Gerald, Institute for Computer Applications in Science and Engineering, USA; Munoz, Cesar, Institute for Computer Applications in Science and Engineering, USA; Butler, Ricky, NASA Langley Research Center, USA; DiVito, Ben, NASA Langley Research Center, USA; Miner, Paul, NASA Langley Research Center, USA; January 2000; 22p; In English; World Congress on Formal Methods, Sep. 1999, Toulouse, France
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2000-209851; NAS 1.26:209851; ICASE-2000-4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

PVS is a state-of-the-art theorem-proving tool developed by SRI International. It is used in a variety of academic and real-world applications by NASA and ICASE researchers, for whom tool customization and extensibility are becoming increasingly important issues. This paper shows, by referring to past experiences with several projects and case studies, that tile customization features currently offered by PVS are often insufficient. It also suggests several improvements regarding PVS's customization in the short run and regarding its extensibility in the long run.
Author
Computer Programs; Theorem Proving

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COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20000046607 Maribor Univ., Fakulteta za Elektrotehniko, Maribor, Slovenia
A Comparison of COBRA and RMI Distributed Object Models with an Emphasis on Performance *Primerjava Porazdeljenih Objektnih Modelov CORBA in RMIs Pourdarkom na Zmogljivostih*
Juric, Matjaz B., Maribor Univ., Slovenia; Rozman, Ivan, Maribor Univ., Slovenia; Hericko, Marjan, Maribor Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 1, pp. 47-54; In Slovak; Copyright; Avail: Issuing Activity

Java has an important role in building distributed object oriented web enabled applications. In the article, an analysis of two distributed object models in the context of the Java language is presented. Although CORBA (Common Object Request Broker Architecture) and RMI (Remote Method Invocation) offer the same basic functionality - hiding the communications details of remote method invocations - they were built on different fundaments. We made a qualitative analysis by comparing several important aspects like features, maturity, support for legacy systems and ease of learning and ease of use. Traditionally performance issues have a high impact on the decision. We also made an in depth quantitative analysis. We ran a series of experiments and tests which give an insight into the performance levels that can be expected from Java applications when used in conjunction with CORBA on one and RMI on the other hand. With the several testing scenarios we measured performances for methods that returned different data types. We completed the measurements on a single computer, on two connected computers and under a heavy client load with up to eight simultaneous clients which invoked methods without delays. The results of single client scenarios are presented. It can be seen that on basic data types RMI is faster than CORBA. The difference is especially noticeable when the client and the server are located on the same computer. The slower results of CORBA are effected by a much greater complexity of the CORBA architecture. Fortunately, the scenario with the client and the server on the same computer is not as important as the scenario where the client and the server are on separate computers. There, the disadvantage of CORBA is much smaller. Also, the performance degradation when objects are distributed across the network is much smaller with the CORBA architecture and was in our test only 6% compared to the 4070 of RMI. More interesting is the difference for larger strings. When CORBA uses the IDL string, it is on average by 75% faster than separate computers. This result is expected because the IDL string is 1 byte long and Java string is 2 bytes long. When comparing the CORBA:s IDL wstring with RMI, it can be seen that RMI is by 18% faster on a single computer, but CORBA is by 12% faster when the client and the server are on separate computers. It can be seen that CORBA handles the network communication better than RMI. The performance degradation when the client and server are

moved on separate computers is with RMI around 40%, with the CORBA string it is around 61% and with the CORBA wstring it is only 16%.
Author
Applications Programs (Computers); Java (Programming Language); Object Programs; Distributed Processing; Architecture (Computers); Computer Systems Performance; Mathematical Models

20000046611 Maribor Univ., Fakulteta za Elektrotehniko, Maribor, Slovenia
On Solving Statistical Language Modeling for Speech Recognition Using a Heterogeneous Computing System ***Statisticno Modeliranje Naravnega Jezika pri Avtomatskem Razpoznavanju Govora z Uporabo Heterogenega Racunalniskega Sistema***
Maucec, Mirjam Sepesy, Maribor Univ., Slovenia; Brest, Janez, Maribor Univ., Slovenia; Kacic, Zdravko, Maribor Univ., Slovenia; Zumer, Viljem, Maribor Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 1, pp. 55-61; In Slovak; Copyright; Avail: Issuing Activity

In this article we discuss probabilistic language modeling. We explain the basic principles of building an n-gram language model. We define metrics of model quality, called perplexity. We introduce a certain type of structure into a language model by using the concept of word equivalence classes. Using classes enables to reduce the problem of sparse date, because the number of model parameters is much smaller in the case of class-based models than in the case of word based models. We present the clustering algorithm which builds the classes automatically by using an iterative procedure to find the optimum of some heuristic functions. As the heuristic function we use training set perplexity. The main bottleneck of clustering algorithm is time complexity. In the second part of the article we describe some further improvements of clustering algorithm. First, we introduce two versions of algorithms based on the clustering algorithms from literature. The main idea is to improve the clustering algorithm. Therefore, we introduce the randomized version of algorithms. Secondly, we parallelized algorithms to execute on a heterogeneous computing system. Heterogeneous computing includes both parallel and distributed processing. In general, the goal of heterogeneous computing is to assign each subtask to one of the machines in the system resulting the total execution time (computation time and inter-machine communication time) of the application program is minimized. Mapping can be specified statically or determinated at runtime by load balancing algorithms. In heterogeneous computing, the structure of a problem may be known, but the structure of the system can change dynamically. In a heterogeneous system, individual subtasks can be matched to the best-suited processor. The network layer can provide interconnectivity between computing sites, Communication tools suitable for network heterogeneous computing (NHQ are message passing interface (MPI), parallel virtual machine (PVM), portable programs for parallel processors (N), etc. We used MPI/LAM. Local Area Multicomputer (LAM) [2,11] is a parallel environment development system of independent computers. It features the MPI programming standard, supported by extensive monitoring and debugging tools. by using heterogeneous computing the clustering algorithm was paralelized. Some experiments on the building of the word processing classes were carried out on a Slovene corpus. We present experimental results. The rest of the paper is organized as follows. In Section 2 an overview of the language modeling is given. A concept of word equivalence classes is described. The clustering algorithm is presented. A brief overview of the network heterogeneous computing and task scheduling is described. Some improvements of the clustering algorithms are presented. Experimental results of the implemented clustering algorithm on a heterogeneous computing system are presented. Conclusion remarks and some guidelines for future work are given.
Author
Heterogeneity; Speech Recognition; Statistical Analysis; Mathematical Models; Parallel Processing (Computers); Algorithms; Words (Language)

20000046617 Systems View, Highlands Ranch, CO USA
An Investigation of System Identification Techniques for Simulation Model Abstraction ***Final Report, Mar. - Nov. 1999***
Popken, Douglas A., Systems View, USA; Cox, Louis A., Systems View, USA; Feb. 2000; 87p; In English
Contract(s)/Grant(s): F30602-99-C-0052; AF Proj. 459S
Report No.(s): AD-A375285; AFRL-IF-RS-TR-2000-8; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

This report summarizes research into the application of system identification techniques to simulation model abstraction. System identification produces simplified mathematical models that approximate the dynamic behaviors of the underlying stochastic simulations. Four state-space system identification techniques were examined: Canonical State-space, Compartmental Models, Maximum Entropy, and Hidden Markov Models (HMM). Two stochastic simulation models were identified: the ”Attrition Simulation”, a simulation of two opposing forces, each operating with multiple weapon system types; and the ”Mission Simulation,” a simulation of a squadron of aircraft performing battlefield air interdiction. The system identification techniques were evaluated and compared under a variety of scenarios on how well they replicate the distributions of the simulation states and decision outputs. Encouraging results were achieved by the HMM technique applied to Attrition Simulation - and by the Maximum Entropy tech-

nique applied to the Mission Simulation. This report also discusses the run-time performance of the algorithms, the development of suitable model structures, and implications for future efforts.
DTIC
System Identification; Mathematical Models; Stochastic Processes; Combat

20000048276 Washington Univ., Dept. of Mechanical Engineering, Saint Louis, MO USA
High Performance Computing for Engineering Analysis and Design ***Final Report, 1 May - 31 Dec. 1997***
Szabo, Barna A.; Dec. 31, 1997; 18p; In English
Contract(s)/Grant(s): F49620-97-1-0268
Report No.(s): AD-A375945; CCM-99-02; AFRL-SR-BL-TR-00-0102; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This grant was used for upgrading an SGI Power Challenge L supercomputer and for the acquisition of 3 SGI O2 workstations to serve DoD research projects in three general areas: (1) Research on the p- and hp-versions of the Finite Element Method conducted by the Center for Computational Mechanics. (2) Research on non-linear control systems conducted in the Department of Systems Science and Mathematics. (3) Rotorcraft analysis and simulation conducted in the Department of Mechanical Engineering.
DTIC
Mechanical Engineering; Reliability Analysis; Stress Analysis; Aircraft Design; Computer Aided Design; Control Systems Design

20000048484 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
The Architecture Based Design Method ***Final Report***
Bachmann, Felix; Bass, Len; Chastek, Gary; Donohoe, Patrick; Peruzzi, Fabio; Jan. 2000; 61p; In English
Contract(s)/Grant(s): F19628-95-C-0003
Report No.(s): AD-A375851; CMU/SEI-00-TR-001; ESC*-TR-00-001; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This paper presents the Architecture Based Design (ABD) method for designing the high-level software architecture for a product line or long-lived system. Designing an architecture for a product line or long-lived system is difficult because detailed requirements are not known in advance. The ABD method fulfills functional, quality, and business requirements at al level of abstraction that allows for the necessary variation when producing specific products. Its application relies on an understanding of the architectural mechanisms used to achieve this fulfillment. The method provides a series of steps for designing the conceptual software architecture. The conceptual software architecture provides organization of function, identification of synchronization points for independent threads of control, and allocation of function to processors. The method ends when commitments to classes, processes and operating system threads begin to be made. In addition, one output of the method is a collection of software templates that constrain the implementation of components of different types. The software templates include a description of how components interact with shared services and also include ”citizenship” responsibilities for components.
DTIC
Software Engineering; Functional Design Specifications; Architecture (Computers)

20000048487 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Second DoD Product Line Practice Workshop Report ***Final Report***
Bergey, John; Campbell, Grady; Clements, Paul; Cohen, Sholom; Jones, Lawrence; Oct. 1999; 79p; In English
Contract(s)/Grant(s): F19628-95-C-0003
Report No.(s): AD-A375845; CMU/SEI-99-TR-015; ESC*-TR-99-015; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Software Engineering Institute (SEl) held the Second Department of Defense (DoD) Product Line Practice Workshop in March 1999. The workshop was a hands-on meeting to identify industry-wide best practices in software product lines; to share DoD product line practices, experience, and issues; and to discuss ways in which the current gap between commercial best practice and DoD practice can be bridged. This report synthesizes the workshop presentations and discussions.
DTIC
Software Engineering; Computer Programming; Defense Program; Procedures

20000048489 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Fourth Product Line Practice Workshop Report ***Final Report***
Bass, Len; Clements, Paul; Donohoe, Patrick; McGregor, John; Northrop, Linda; Feb. 2000; 47p; In English
Contract(s)/Grant(s): F19628-95-C-0003
Report No.(s): AD-A375843; CMU/SEI-2000-TR-002; ESC*-TR-2000-002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Fourth Software Engineering Institute (SEI) Product Line Practice Workshop was a hands-on meeting held in December 1999 to share industry practices in the area of tool support for software product lines, to explore the technical and non-technical issues involved, and to evolve the SEI Product Line Practice Framework. This report synthesizes the workshop presentations and discussions, which described practices and issues associated with tool support for software product lines.
DTIC
Software Engineering; Marketing; Conferences; Computer Programming

20000048499 Technische Hogeschool Twente, Centre for Telematics and Information Technology, Enschede, Netherlands
Conceptual Frameworks for the Development of CSCW Systems
GuareisdeFarias, Clever Ricardo, Technische Hogeschool Twente, Netherlands; Ferreira Pires, Luis, Technische Hogeschool Twente, Netherlands; vanSinderen, Marten, Technische Hogeschool Twente, Netherlands; 2000; 44p; In English
Report No.(s): PB2000-104703; CTIT-TR-99-16; Copyright; Avail: National Technical Information Service (NTIS)

Models and theories concerning cooperation have long been recognized as an important aid in the development of Computer Supported Cooperative Work (CSCW) systems. However, there is no consensus regarding the set of concepts and abstractions that should underlie such models and theories. Furthermore, common patterns are hard to discern in different models and theories. This paper analyzes a number of existing models and theories, and proposes a generic conceptual framework based on the strengths and commonalities of these models. The authors analyze five different developments, viz., Coordination Theory, Activity Theory, Task Manager model, Action/Interaction Theory and Object-Oriented Activity Support model, to propose a generic model based on four key concepts common to these developments, viz. activity, actor, information and service.
NTIS
Systems Engineering; Data Bases; Object-Oriented Programming; Distributed Processing

20000048500 Technische Univ., Centre for Telematics and Information Technology, Twente, Netherlands
U-WISH: Specification Techniques for Multi-Modal Dialogues
Donk, O., Technische Univ., Netherlands; vanDijk, B., Technische Univ., Netherlands; Nijholt, A., Technische Univ., Netherlands; 2000; 40p; In English
Report No.(s): PB2000-104706; CTIT-TR-99-13; Copyright; Avail: National Technical Information Service (NTIS)

In this report the authors describe the development of a specification technique for specifying interactive web-based services. The authors wanted to design a language that can be a means of communication between designers and developers of interactive services, that makes it easier to develop web-based services fitted to the users and that shortens the pathway from design to implementation. The language, still under development, is based on process algebra and can be connected to the results of task analysis. The authors have been working on the automatic generation of executable prototypes out of the specifications. In this way the specification language can establish a connection between users, design and implementation. A first version of this language is available as well as prototype tools for executing the specifications. Ideas will be given as to how to make the connection between specifications and task analysis.
NTIS
Algebra; Prototypes; Software Engineering; Programming Languages

20000048501 Technische Hogeschool Twente, Centre for Telematics and Information Technology, Enschede, Netherlands
Distributed Global Transaction Support for Workflow Management Applications
Vonk, J., Technische Hogeschool Twente, Netherlands; Grefen, P., Technische Hogeschool Twente, Netherlands; Boertjes, E., Technische Hogeschool Twente, Netherlands; Apers, P., Technische Hogeschool Twente, Netherlands; 2000; 36p; In English
Report No.(s): PB2000-104708; CTIT-TR-99-11; Copyright; Avail: National Technical Information Service (NTIS)

Workflow management systems require advanced transactions support to cope with their inherently long-running processes. The recent trend to distribute workflow executions requires an even more advanced transaction support system that is able to handle distribution. This report presents a model as well as an architecture to provide distributed advanced transaction support. Characteristic of the transaction support system is the ability to deal with arbitrary distribution of business processes over multiple workflow management systems and the support for flexible rollbacks. The modularity of the architecture and the orthogonality

with respect to the workflow management system allows the transaction system to be applied in other application areas as well. The high scalability of the architecture allows an arbitrary combination of transaction support systems and workflow management systems of which the locations are irrelevant. In the WIDE project, the developed technology is applied to the FORO workflow management system.
NTIS
Management Systems; Orthogonality; Support Systems; Systems Management; Distributed Parameter Systems

20000048502 National Inst. of Standards and Technology, Manufacturing Systems Integration Div., Gaithersburg, MD USA
Standards Road Map Project. Standards Classification Strategy and Methodology: A Task of the Manufacturing- Enterprise-Integration Project
Nell, James G., National Inst. of Standards and Technology, USA; Christopher, Neil B., National Inst. of Standards and Technology, USA; Oct. 1999; 36p; In English
Report No.(s): PB99-177214; NISTIR-6409; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
This document describes a research project to recommend a decision tool that the Manufacturing Systems Integration Division (MSID) could use during its strategic-planning process to evaluate which standards activities to support. This paper describes how to apply a methodology originally developed to identify relevant standards that could enable shop-floor processes to interoperate more effectively. A classification strategy is presented to categorize the standards identified during the standards-identification process. A vision for a World-Wide-Web based information resource is presented. A road map that relates the methodology to the division strategic-planning process is discussed. Proposals for further work are included.
NTIS
Standards; Scheduling; Computer Aided Manufacturing; Classifications; Management Planning

20000048616 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Basic Concepts of Product Line Practice for the DoD *Final Report*
Bergey, John; Fisher, Matt; Gallagher, Brian; Jones, Lawrence; Northrop, Linda; Feb. 2000; 28p; In English
Contract(s)/Grant(s): F19628-95-C-0003
Report No.(s): AD-A375859; CMU/SEI-2000-TN-001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Industrial experience demonstrates clearly that a product line approach for software-intensive systems can save money and result in faster time to field higher quality systems. Many within the Department of Defense (DoD) recognize the benefits of product lines, but also recognize that there are significant challenges to adopting this approach. Many of these challenges stem from the fact that the DoD is in the business of acquiring systems rather than developing them. The Product Line Systems Program is publishing a series of technical notes designed to condense knowledge about product line acquisition practices into a concise and usable form for the DoD acquisition manager and practitioner. This technical note provides background information about product lines to serve as a foundation for other technical notes in this series. Key terms, concepts, and benefits of a product line approach are given. Additionally, concepts of product line acquisition in a DoD context are discussed.
DTIC
Software Engineering; Marketing; Defense Program

20000048622 Space and Naval Warfare Systems Center, San Diego, CA USA
CHIEF2000 Users Manual *Final Report*
Benthien, G. W.; Barach, D.; Hobbs, S.; Mar. 2000; 112p; In English
Report No.(s): AD-A375975; TD-3104; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This Users Guide explains the new CHIEF2000 computer program and describes the setup of the user-generated input file.
DTIC
Computer Programs; User Manuals (Computer Programs); Underwater Acoustics

20000048626 Department of the Navy, Washington, DC USA
Computer Software for Converting a General Purpose Computer Network into an Interactive Communications System
Simonoff, Adam J., Inventor; Apr. 23, 1999; 66p; In English
Patent Info.: Filed 23 Apr. 1999; US-Patent-Appl-SN-09/296,746
Report No.(s): AD-D019625; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche
Machine readable code stored in a memory converts a general purpose computer system into a dedicated White Board system facilitating collaboration between a plurality of users. Preferably, execution of the machine readable code generates a predetermined object placement tool for generating predetermined objects which are displayable at user-selected locations on a White

Board screen, a text placement tool for generating text objects which are displayable at user-selected locations of the White Board screen, a hyperlink connection tool for generating active hyperlink objects which are displayable at user-selected locations on the White Board screen, a track object tool for placing active track objects which are displayable at user-selected locations on the White Board screen, a freehand drawing tool for generating freehand drawing objects which are displayable at user-selected locations on the White Board screen, a transmission device for transmitting all generated ones of the predetermined, the active hyperlink, the text, the active track, and the freehand drawing objects to each of the users, an accumulating device for accumulating the predetermined, the active hyperlink, the text, the active track, and the freehand drawing objects, and a filter device permitting selective transmission of the predetermined, the active hyperlink, the text, the active track, and the freehand drawing objects to users.
DTIC
Computer Programs; Software Engineering; Client Server Systems; Patent Applications

20000048634 Department of the Navy, Washington, DC USA
VXI Test Executive
McKeon, Brian T., Inventor; Larson, Mark C., Inventor; Sherman, Douglas H., Inventor; Nov. 23, 1999; 9p; In English; Supersedes US-Patent-Appl-SN-08/969530, AD-D018831
Patent Info.: Filed 16 Sep. 1997; US-Patent-5,991,537; US-Patent-Appl-SN-08/969,530
Report No.(s): AD-D019634; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A system is provided for developing program test sets with test hardware conforming to well known test industry standards, such as VXI, VME and GPIB standards. The system has a computer with a display console. After initialization and password checks, the console displays a front panel from which a user chooses the instruments, switches connections, inputs, outputs, etc. which make up the program test set. As each choice is made, the system generates test script corresponding to the choice. The system then uses the test script, or macro, to generate the graphical representation of the component and its connections on the display. The graphical displays are standardized for each functional component or operation of a program test set, as well as being standardized between program test sets The macros further allow a program test set to he more efficiently developed by coding macros rather than by developing graphical displays. The combined macros for the entire test set provide written documentation for the program test set, allowing fur easy configuration management of the program test set.
DTIC
Computer Information Security; Selective Dissemination of Information; Information Retrieval; Software Engineering; Computer Programming; Program Verification (Computers)

20000048808 NASA Johnson Space Center, Houston, TX USA
A Goal-Seeking Strategy for Constructing Systems from Alternative Components
Valentine, Mark E., NASA Johnson Space Center, USA; May 2000; 24p; In English
Report No.(s): NASA/TM-2000-209265; S-847; NAS 1.15:209265; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a methodology to efficiently construct feasible systems, then modify feasible systems to meet successive goals by selecting from alternative components; a problem recognized to be n-p complete. The methodology provides a means to catalog and model alternative components. A presented system modeling structure is robust enough to model a wide variety of systems and provides a means to compare and evaluate alternative systems. These models act as input to a methodology for selecting alternative components to construct feasible systems and modify feasible systems to meet design goals and objectives. The presented algorithm's ability to find a restricted solution, as defined by a unique set of requirements. is demonstrated against an exhaustive search of a sample of proposed Shuttle modifications. The utility of the algorithm is demonstrated by comparing results from the algorithm with results from three NASA Shuttle evolution studies using their value systems and assumptions.
Author
Systems Engineering; Feasibility; Procedures

20000048813 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
A Flexible Statechart-to-Model-Checker Translator
Rouquette, Nicolas, Jet Propulsion Lab., California Inst. of Tech., USA; Dunphy, Julia, Jet Propulsion Lab., California Inst. of Tech., USA; Feather, Martin S., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 5p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Many current-day software design tools offer some variant of statechart notation for system specification. We, like others, have built an automatic translator from (a subset of) statecharts to a model checker, for use to validate behavioral requirements.

Our translator is designed to be flexible. This allows us to quickly adjust the translator to variants of statechart semantics, including problem-specific notational conventions that designers employ. Our system demonstration will be of interest to the following two communities: (1) Potential end-users: Our demonstration will show translation from statecharts created in a commercial UML tool (Rational Rose) to Promela, the input language of Holzmann's model checker SPIN. The translation is accomplished automatically. to accommodate the major variants of statechart semantics, our tool offers user-selectable choices among semantic alternatives. Options for customized semantic variants are also made available. The net result is an easy-to-use tool that operates on a wide range of statechart diagrams to automate the pathway to model-checking input. (2) Other researchers: Our translator embodies, in one tool, ideas and approaches drawn from several sources. Solutions to the major challenges of statechart-to-model-checker translation (e.g., determining which transition(s) will fire, handling of concurrent activities) are retired in a uniform, fully mechanized, setting. The way in which the underlying architecture of the translator itself facilitates flexible and customizable translation will also be evident.
Derived from text
Software Engineering; Computer Programs; Software Development Tools; Translating

20000048824 Army Engineer Research and Development Center, Environmental Lab., Vicksburg, MS USA
FISHFATE Users Guide: Spacially Temporally Explicit Population Simulation Model
Clarke, Douglas G.; Ault, J. S.; Meester, G. A.; Lindeman, K. C.; Juo, J.; Mar. 2000; 15p; In English
Report No.(s): AD-A375965; ERDC/EL-TN-DOER-E11; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
The evaluation of alternative environmental windows for dredging operations, which represent a broad spectrum of project and site specific conditions (e.g., type of dredge plant, local hydrodynamics, bathymetry, etc.) requires development of a spatially and temporally explicit population simulation model. Unless spatial dynamics are accounted for, exploration of spatial and/or temporal alternatives is impractical and is of limited effectiveness (Pelletier and Magal 1996). Ultimately, an integrated biophysical and population modeling package is needed that contains coupled population-dynamic, hydrodynamic, fate-and-transport, and bioenergetic models that can be applied in spatially-explicit formats. This Users Guide details a population-dynamic model that provides a quantitative biological foundation for such an integrated modeling package.
DTIC
Environment Models; Dynamic Models; Computerized Simulation

20000050245 Technische Hogeschool Twente, Centre for Telematics and Information Technology, Enschede, Netherlands
Using the Tools in TRADE III: A Controller for a Compact Dynamic Bus Station
Wieringa, R. J., Technische Hogeschool Twente, Netherlands; 2000; 36p; In English
Report No.(s): PB2000-104705; CTIT-TR-99-15; Copyright; Avail: National Technical Information Service (NTIS)
Contents include the following: Introduction; Business Requirements; System Requirements; Essential Architecture; Discussion; Specification Dictionary.
NTIS
Computer Programs; Commerce; Ground Effect Machines

20000050372 Technische Hogeschool Twente, Centre for Telematics and Information Technology, Enschede, Netherlands
Case Study on Adaptability Problems of the Separation of User Interface and Application Semantics
Evers, Marc, Technische Hogeschool Twente, Netherlands; 2000; 38p; In English
Report No.(s): PB2000-104704; CTIT-TR-99-14; Copyright; Avail: National Technical Information Service (NTIS)
A large number of software architectures for interactive have been described in literature, like the Seeheim, PAC-Amodeus, and Model-View-Controller architectures. Most of these architectures are based on the traditional view of interactive software, namely the view that an interactive software system can be separated in an application part and a user interface part. The application part contains the functionality of the software--what the system does--and the user interface part contains the representation of this functionality to the user(s) of the system. The motivation behind these architectures is to improve, among others, adaptability, portability, complexity handling, and separation of concerns of interactive software. The principle of separating interactive software in application and user interface parts has its merits. It can however lead to serious adaptability problems in software that provides fast, frequent and intensive feedback, in particular semantic feedback. Semantic feedback refers to feedback the system gives to the user concerning the semantics of the application, i.e. the objects that the user perceives and manipulates. In these systems, the boundary between application and user interface becomes less sharp and the semantics of the interface and the

application tend to be highly coupled. Examples of such interactive systems are direct manipulation systems, virtual reality systems, and systems with natural language interfaces.
NTIS
Software Engineering; Semantics; Research; Adaptation; Natural Language (Computers)

20000050373 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
Year 2000 Computing Crisis: Key Actions Remain to Ensure Delivery of Veterans Benefits and Health Services. Statement of Joel C. Willemssen, Director, Civil Agencies Information Systems, Accounting and Information Management Division
Apr. 20, 1999; 30p
Report No.(s): PB2000-104230; GAO/T-AIMD-99-152; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We focus on the Y2K readiness of automated systems that support the delivery of benefits and health care services, the compliance status of biomedical equipment used in patient care, and the Y2K readiness of the pharmaceutical and medical-surgical manufacturers upon which VA relies. In discussing biomedical equipment and pharmaceutical manufacturers, we also share with you information on the Food and Drug Administration's (FDA) Y2K efforts.
NTIS
Systems Management; Automatic Control; Information Systems; Medical Services

20000050374 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
Year 2000 Computing Challenge: Readiness Improving but Much Work Remains to Ensure Delivery of Critical Services. Statement of Joel C. Willemssen, Director, Civil Agencies Information Systems, Accounting and Information Management Division
Apr. 19, 1999; 36p; In English
Report No.(s): PB2000-104227; GAO/T-AIMD-99-149; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
I highlight the Year 2000 risks facing the nation, discuss the federal government's progress and remaining challenges in correcting its systems, identify state and local government Year 2000 issues, and provide an overview of the available information on the readiness of key public infrastructure and economic sectors.
NTIS
Systems Management; Information Systems; Governments; Economics

20000051479 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
Year 2000 Computing Challenge: Federal Government Making Progress but Critical Issues Must Still Be Addressed to Minimize Disruptions. Statement of Gene L. Dodaro, Assistant Comptroller General, Accounting and Information Management Division
Apr. 14, 1999; 36p
Report No.(s): PB2000-104226; GAO/T-AIMD-99-144; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The report outlines the actions that the federal government has taken to improve its Year 2000 approach; summarizes the status of the federal government's remediation of its mission-critical systems, with a particular focus on those that are not yet compliant; discusses the reported status of state-administered federal programs; and describes the main remaining challenges facing the government in ensuring the continuity of business operations, namely end-to-end testing and contingency planning.
NTIS
Information Management; Governments; Planning

20000051480 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
Year 2000 Computing Crisis: Additional Work Remains to Ensure Delivery of Critical Services. Statement of Joel C. Willemssen, Director, Civil Agencies Information Systems, Accounting and Information Management Division
Apr. 13, 1999; 18p
Report No.(s): PB2000-104225; GAO/T-AIMD-99-143; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
I discuss the status of the federal government's remediation of its mission-critical systems. In addition, I lay out some of the remaining challenges facing the government in ensuring the continuity of business operations, namely end-to-end testing and business continuity and contingency planning, and the Office of Management and Budget's (OMB) efforts to identify the government's high-impact programs. Finally, I discuss the readiness of state systems that are essential to the delivery of federal human services programs.
NTIS
Systems Management; Information Systems; Governments

20000051528 Wisconsin Univ., Dept. of Computer Sciences, Madison, WI USA
Models and Solution for On-Demand Data Delivery Problems
Ferris, Michael C.; Meyer, Robert R.; Jan. 1999; 15p; In English
Contract(s)/Grant(s): F49620-98-1-0417; NSF-CCR96-19765
Report No.(s): AD-A375527; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Supporting on-demand access to large, widely shared data such as popular video objects and internet web sites requires effective use of caching at regional (proxy) servers. This caching problem is very complex because of the need to consider bandwidth as well as storage constraints at the regional servers, and because of the bandwidth sharing possibilities provided by recently proposed delivery techniques. A linear mixed integer model is developed to configure the allocation of data objects in a hierarchical architecture containing one or more shared central servers and multiple regional servers. We will describe motivation and format of the basic model, and several enhancements to the model formulation and solution process that are necessary to solve the problem within reasonable time limits.
DTIC
Client Server Systems; Internets; On-Line Systems; Data Management; Information Systems

20000051530 Oregon Graduate Inst. of Science and Technology, Pacific Software Research Center, Portland, OR USA
Formal Language Design in the Context of Domain Engineering
Widen, Tanya; Mar. 28, 2000; 96p; In English
Contract(s)/Grant(s): F19628-96-C-0161
Report No.(s): AD-A375511; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Even though many domain specific languages have been implemented, there is a lack of well defined methods available for both analyzing domains with the intent of creating a domain specific language and developing the domains specific languages. The research presented in this thesis aims at this problem by capturing, analyzing and merging two methods that define domain engineering processes. Initial analysis of the methods indicated that they have complementary strengths. Therefore, merging the two methods promises to produce a more robust method. Will the integration of two domain engineering methods - one which has a mature domain analysis phase, and one which has a well studied method for developing domain specific languages given an appropriate domain analysis - produce such a complete formal domain engineering method? It is the thesis of this research that integrating the key features of each method will indeed produce a more robust method. Capturing the two methods involves studying documents describing the processes as well as obtaining additional information from experts on the techniques of the methods. Capturing the definition of the methods and validating these definitions with experts is essential to ensure that the process is correctly understood. For one of the methods much additional work has to be done to synthesize information from the method experts, as the definition of the method is not well documented or agreed upon.
DTIC
Software Engineering; Object-Oriented Programming; High Level Languages; Language Programming

20000052133 IBM Federal Systems Div., Houston, TX USA
Development of Application Software Hierarchy for Reuse (DASH'R) ***Final Report, Apr. 1995 - Jun. 1999***
Sentman, Larry; Mar. 2000; 131p; In English
Contract(s)/Grant(s): F30602-95-2-0006; DARPA ORDER-C540; AF Proj. C540
Report No.(s): AD-A375891; AFRL-IF-RS-TR-2000-20; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

The goal of this Technology Reinvestment Program Focus Area is to radically reduce the effort required to field new software applications through the development of reusable software components. Today an estimated 85% of the installed base is a custom application, with all components written especially for that software package. "Object Oriented Software", an emerging software technology, which is becoming widely used in the development of new software, offers the promise of reusability and ease of modification for both Defense and commercial applications. However, the promise can only be realized if the use of object oriented software is created according to an established set of standards and if appropriate reusable software components are developed. Building on emerging industry standards for software object technologies, these projects will significantly accelerate development of tools to help build the infrastructure for component ware, create a pool of developers experienced with applying the new tools, and deliver a series of demonstration applications with both commercial and defense relevance.
DTIC
Software Engineering; Technology Utilization; Computer Aided Manufacturing

20000052476 Technische Hogeschool Twente, Centre for Telematics and Information Technology, Enschede, Netherlands
Engineering Approach to Atomic Transaction Verification: Use of a Simple Object Model to Achieve Semantics-Based Reasoning at Compile-Time
Spelt, D.; Even, S.; Aug. 25, 1998; 26p; In English
Report No.(s): PB2000-104720; CTIT-TR-98-17; No Copyright; Avail: National Technical Information Service (NTIS)

In this paper, we take an engineering approach to atomic transaction verification. We discuss the design and implementation of a verification tool that can reason about the semantics of atomic database operations. to bridge the gap between language design and automated reasoning, we make use of a simple model of objects that imitates the type-tagged memory structure of an implementation. This simple model is sufficient to describe the operational semantics of the typical features of an object-oriented database programming language, such as bounded iteration, heterogeneity, object creation, and nil values. The same model lends itself to automated reasoning with a theorem prover system. We are thus able to apply theorem prover technology to verification problems that address transaction semantics. The work has applications in the areas of transaction safety, semantics-based concurrency control, and cooperative work. The approach is illustrated by a graph editing example, with heterogeneous node structures.
NTIS
Data Bases; Object-Oriented Programming; Data Base Management Systems; Semantics

20000052482 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle, UK
Production Cell Controlled by Dependable Multiparty Interactions
Zorzo, A. F.; Jul. 1999; 24p; In English
Report No.(s): PB2000-103780; CS-TR-667; Copyright; Avail: National Technical Information Service (NTIS)

The goal of this paper is twofold. Firstly, we present a way of extracting interactions between objects and enclosing them by using multiparty interactions. In a multiparty interaction, several executing threads somehow 'come together' to produce an intermediate and temporary combined state, use this state to execute some activity, and then leave this interaction and continue their normal execution. This kind of approach has been considered in several papers but all of them have failed to describe how failures in one or more participants of the multiparty interaction can be dealt with. In this paper, general object-oriented schemes for constructing dependable multiparty interactions (DMIs) in a distributed environment are presented. Secondly, we show how one of these schemes can be used to program a system in which multiparty interactions are more than simple synchronizations or communications. We have designed and implemented a controlling software for a fault-tolerant production cell model developed by Forschungszentrum Informatik, Karlsruhe, Germany.
NTIS
Object-Oriented Programming; Computer Systems Programs

20000052485 Technische Hogeschool Twente, Centre for Telematics and Information Technology, Enschede, Netherlands
Two Case Studies of Subsystem Design for Extensible General-Purpose Software
Grefen, P.; Sikkel, K.; Wieringa, R.; 1998; 28p; In English
Report No.(s): PB2000-104723; CTIT-TR-98-14; Copyright; Avail: National Technical Information Service (NTIS)

In this paper, we discuss subsystem design guidelines for extensible general-purpose information systems, i.e., systems that are designed to be applicable in different application areas. We extract guidelines from a case study of the redesign and extension of an advanced commercial workflow management system and place them into the context of existing software engineering research. The guidelines are then validated against the design decisions made in the construction of a widely used web-based CSCW system. Key aspect in our approach is the distinction between essential and physical architectures. The essential architecture is based on functional requirements, paying proper attention to the direct mapping of abstract functional concepts to modules in the architecture. Non-functional requirements are reflected in the physical architecture, taking into account software clustering, distribution, and replication.
NTIS
Software Engineering; Management Systems; Information Systems; Computer Systems Design

20000052486 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle, UK
Exceptions and Eventflow
Holt, C. M.; Nov. 1999; 18p; In English
Report No.(s): PB2000-103777; CS-TR-660; Copyright; Avail: National Technical Information Service (NTIS)

Exceptions historically derive from a single-threaded, imperative model of computation. Rather than including tests for the success of subsidiary operations at every procedure level using if-then-else's it was deemed simpler to describe problems only where they arise and where they are dealt with. The catch-throw style was transferred to C++ (and then Java), and also grafted

onto the I/O structures of declarative languages such as Prolog and Haskell. However, the evolution from object oriented to event-oriented programming and the blending of this with a declarative base has led to a rather different view of computation, one which raises new questions about the relationships among events, exceptions and interrupts. This paper looks at some of these.
NTIS
Computation; C++ (Programming Language)

20000052487 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle, UK
Engineering Look-Ahead in Distributed Conversations
Ezhilchelvan, P.; Romanovsky, A.; Jul. 1999; 28p; In English
Report No.(s): PB2000-103776; CS-TR-659; Copyright; Avail: National Technical Information Service (NTIS)

This paper investigates the effects of relaxing the synchronization embedded in 'classical' conversation schemes. Look-ahead conversation scheme (4) enables the synchronization mandated by conversations to be performed concurrently to other normal system activities, and thereby provides scope for enhancing system performance. In this paper, the authors take the view that permitting look ahead must guarantee that executions with and without look ahead be equivalent for identical inputs and run-time conditions. The authors identify and formulate the necessary condition for meeting this objective. The authors then present two schemes for realizing this condition. The first scheme is based on piggybacking extra information onto ongoing messages, and the second one is a message passing protocol requiring each participant to send one message to every other participant of the conversation. These schemes do not require a conversation participant to know a priori all participants of the conversation, but only those it is designed to interact with, during the conversation.
NTIS
Systems Engineering; Synchronism

20000052488 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle, UK
Choosing Effective Methods for Design Diversity. How to Progress from Intuition to Science
Popov, P.; Romanovsky, A.; Strigini, L.; Jul. 1999; 18p; In English
Report No.(s): PB2000-103774; CS-TR-666; Copyright; Avail: National Technical Information Service (NTIS)

Design diversity is a popular defense against design faults in safety critical systems. Design diversity is at times pursued by simply isolating the development teams of the different versions, but there are good reasons to believe that it is better to 'force' diversity, by appropriate prescriptions to the teams. There are many ways of forcing diversity. The literature, including standards and guidelines, includes lists of such ways at the disposal of a project manager, e.g. dictating different algorithms, different programming or specification languages, etc. Yet, managers who have to choose a cost-effective combination of these have little guidance except their own intuition. Unfortunately, intuition has often proven wrong when dealing with diversity. The authors argue the need for more scientifically based recommendations, and outline the problems with producing them. The authors focus on what they think is the standard basis for most recommendations: the belief that project decisions should be aimed at causing 'diversity' among the faults of the various versions, and that this diversity will in turn decrease the risk of the versions failing together. The authors attempt to clarify what these beliefs mean, in which cases they may be justified and how they can be checked or disproved experimentally.
NTIS
Programming Languages; Software Engineering; Systems Analysis

20000052489 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle, UK
Dynamic Selection of Software Components in the Face of Changing Requirements
Merad, S.; deLemos, R.; Anderson, T.; Jul. 1999; 38p; In English
Report No.(s): PB2000-103773; CS-TR-664; Copyright; Avail: National Technical Information Service (NTIS)

Software components are characterized by their functional and non-functional properties. It is both difficult and expensive to build a software component that excels in all its non-functional properties and that can cop with a large input range for all environmental variables. The authors envisage to provide a computing system operating in a changing environment with a pool of software components, each having a specific profile, and a decision maker that selects the best component subject to the time varying environmental requirements. The resulting decision problem is a multi-attribute optimization problem. In this paper, the authors propose several solution concepts for this problem and evaluate them qualitatively with respect to many criteria. Two of these concepts are treated in detail. The first is based on the combined utility function and the second is the compromise between the preference patterns of the various properties. The latter is game theoretic, and the solution is found by formulating the problem as a gargaining game. While the combined utility function can be expressed in a simple form when some independence assumptions between the properties hold, and it can incorporate the decision maker's value trade-offs, it involves evaluating subjectively

a number of coefficients. But because the evaluations also need to be performed during run-time for new requirements, this becomes problematic. The game theoretic solution does not incorporate explicitly the decision maker's value trade-offs, but it is free of the subjective element and no evaluations are needed during run-time.
NTIS
Computer Programs; Software Engineering

20000052514 Army Construction Engineering Research Lab., Champaign, IL USA
Geospatial Data Computer-Based Training *Final Report*
Dilks, Kelly; Miller, Jeffery; Patel, Amit; Cookas, Jim; Feb. 2000; 3p; In English
Report No.(s): AD-A375198; CERL-TN-00-1; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The U.S. Army Corps of Engineers uses geospatial data in all facets of its mission. At present, the geospatial data is not properly documented or managed and the potential loss of information is great. Engineering Division of Headquarters, U.S. Army Corps of Engineers (HQUSACE) is working toward assisting USACE elements with geospatial data management and documentation via the Federal Geographic Data Committee (FGDC) Content Standard for Geospatial Metadata. Metadata is the documentation of the data that describes the accuracy, content, applicability, and distribution information about the geospatial data. To facilitate the creation of metadata, HQUSACE developed a training program to teach USACE personnel the metadata standard. to make the training available to a wider audience, ERDC developed a computer-based training module. The module covers several topics related to geospatial data such as metadata, standards, and the geospatial data clearinghouse. The module is located on the USACE Geospatial Data server at http://corpsgeol.usace.army.mil and is available free to any USACE employee or contractor. The program was developed with Macromedia Authorware 5 (http:www.macromedia.com) in Windows NT/95 environments. The metadata computer-based training course is the first of many courses planned for deployment via the Internet.
DTIC
Computer Techniques; Computer Assisted Instruction; Data Management

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see 82 Documentation and Information Science. For computer systems applied to specific applications, see the associated category.

20000046612 Ljubljana Univ., Faculty of Computer and Information Science, Ljubljana, Slovenia
Distance Learning *Ucenje na Daljavo*
Zrnec, Aljaz, Ljubljana Univ., Slovenia; Solina, Franc, Ljubljana Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 1, pp. 41-46; In Slovak; Copyright; Avail: Issuing Activity

In this paper we discuss distance learning. Distance learning is defined as any formal approach to study, where the teacher and the students are separated in space. In other words, distance learning replaces a physical gap between the teacher and the students. The synchronous and asynchronous types of learning are defined and compared. Synhronous type of learning uses video conferencing systems or computer video conference where all participants must partake in the learning process at the same time. The asynchronous type of distance learning doesn't demand an interaction between students and teachers in real time and is therefore more flexible than synchronous type of learning. Asynchronous learning uses e-mail, Internet forums, WWW, interactive CD roms, etc. Different technologies for learning materials delivery are available: printed materials, audio and video tape, teleconference, radio and TV, interactive multimedia and computer communication with Internet. In this paper, we discuss problems about learning materials, learning objects, standards and problems dealing with creating good educational software. Today, many educational organisations fight with the same problem. Every one of them makes its own educational software and learning materials which are not compatible. A lot of energy is consumed for doing the same things over and over. This kind of situation is not good for any organization which would like to start a program of distance education because it can not decide how to start! Standards which would determine standard formats for educational materials and rules for making educational software are needed. There have already been made some efforts in the area of standards. For example, IMS (International Management System) project promotes open declaration for online activities, searching of educational materials, tracking of student improvement and interchange of student records between administration systems. rMS co-operates with European project Ariadne (Alliance of Remote Instructional Authoring and Distribution Networks for Europe). The result of this co-operation is a basis for specification about rnetadata. Metadata presents information about educational resources by educators themselves. In that case we need special tools for integration of standard educational objects into new educational applications. We also describe how individuals learn successfully on the Web. There are four different learning orientations and we can adapt teaching for three of them. This makes the teach-

ing process more useful and successful. At the end of the paper we analyse distance learning in Slovenia. We describe the study at the High Business School and project CoLoS. The High Business School offers a program of distance education. Students use printed materials and some specially designed books for learning. They also use information available on the Internet, but they don't use the Internet for participating in the class or taking exams. They take exams, at study centers, They can apply for distance learning at study centres in Ptuj, Trebnje and Nova Gorica. The CoLoS project brings together research teams from many European universities to promote the development of innovative teaching methods in science and technology. Interactive learning software from the CoLoS project is available on the Internet free of charge. Under this project, a course for learning the Java programming language is being developed at the Faculty of Computer and information Science of the University of Ljubljana in association with the TV station TevePika.
Author
Internets; Learning; Synchronism; Education; Artificial Intelligence

20000046619 Brown Univ., Dept. of Computer Science, Providence, RI USA
Broadcast Objects for Effective Data Dissemination in BADD ***Final Report, Jul 1997 - May 1999***
Zdonik, Stanley B., Brown Univ., USA; Feb. 2000; 94p; In English
Contract(s)/Grant(s): F30602-97-2-0241; AF Proj. IIST
Report No.(s): AD-A375301; AFRL-IF-RS-TR-2000-10; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

Data dissemination systems are difficult to design properly. Since interest in this topic is relatively new, there is little excerption with methods for making performance decisions. this project has been focused on providing tools for understanding the impact of design decisions in dissemination-based data delivery. We have developed two broad classes of tools. The first is a set of simulation-based tools that allowed us to study fundamental algorithms. We have applied these simulators to the problem of information channelization. We have built a test harness for controlling the deployment of multiple experiments and the collection of results into a convenient graphical form. We see this a major step toward a commander's workbench, a tool to help commanders make resource allocation decisions. The second class of tool is a tool kit that allows us to quickly assemble prototype (perhaps in a local-area network) that mimics the ultimate deployed system. A prototype of this kind can be instrumented and performance measurements can be collected that gives us more realistic insight than a simulator. This approach provides the second line of defense.
DTIC
Systems Engineering; Decision Making; Data Transmission; Selective Dissemination of Information; Information Systems; Computer Information Security; Information Resources Management

20000048279 New Mexico Univ., Center for High Technology Materials, Albuquerque, NM USA
Integrated Wavelength-Space-Time Optical Multiplexing Technologies and Architectures for Large-Scale, Reconfigurable, Multiple-Access Computer Networks ***Final Report, 15 Mar. 1996 - 14 Sep. 1999***
Cheng, Julian; Mar. 20, 2000; 28p; In English
Contract(s)/Grant(s): F49620-96-1-0077
Report No.(s): AD-A375981; FT-1; AFRL-SR-BL-TR-00-0093; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Future computer networks will contain clusters of processors of various sizes that are interconnected over a wide range of distances, from dense local clusters to spatially distributed computer networks. to permit the simultaneous communication amongst many nodes, it will be necessary to develop practical networking technologies that provide multiple access, dynamic reconfigurability, and simultaneous communication through a shared channel. The objectives of this program are to investigate novel optical multiplexing architectures for interconnecting computer networks, and to develop their enabling technologies. To achieve these ends, we will investigate networks that combine wavelength, space, and time division multiplexing in new and different ways. For larger networks, new multiplexing techniques are needed that will use wavelength, space or time more efficiently, either by re-using the available channels or by combining several multiplexing platforms within a single network. These optical multiplexing techniques and their underlying technologies are the focus of the research program.
DTIC
Wavelength Division Multiplexing; Time Division Multiplexing; Computer Networks

20000048485 Naval Postgraduate School, Monterey, CA USA
Virtual Reality Transfer Protocol (VRTP): Implementing a Monitor Application for the Real-Time Transport Protocol (RTP) Using the JAVA Media Framework (JMF)
Afonso, Francisco C.; Sep. 1999; 232p; In English
Report No.(s): AD-A375849; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The Real-time Transport Protocol (RTP) supports the transmission of time-based media, such as audio and video, over wide-area networks (WANs), by adding synchronization and quality-of-service (QoS) feedback capabilities to the existing transport protocol. RTP has been widely used in the Multicast Backbone (MBone), a virtual network that has become a shared worldwide medium for Internet multicast communications. This work presents the design patterns, architecture and implementation of an RTP monitor application using the Java Media Framework (JMF), a new Java Application Programming Interface (API) for multimedia support. An RTP monitor is an application that receives packets from all participants in a multicast session in order to estimate the quality of service for distribution monitoring, fault diagnosis and both short and long-term statistics. This new RTP monitor is available as a component of the Virtual Reality Transfer Protocol (vrtp), a protocol being developed to support large-scale virtual environments (LSVEs) over the Internet. Initial test results are satisfactory for audio and video streams, as well as prototype RTP-compliant Distributed Interactive Simulation (DIS) protocol streams. Future work includes automated monitoring across WANs and standardizing structured data formats to comply with Management Information Base (MIB) requirements using Extensible Markup Language (XML) target set definitions.
DTIC
Virtual Reality; Real Time Operation; Java (Programming Language); Applications Programs (Computers); Packets (Communication); Protocol (Computers)

20000048486 Naval Postgraduate School, Monterey, CA USA
Guaranteeing Fair Access For Multimedia Traffic Using the Smart Algorithm for Multicast ATM Connections
Weekly, Randolph R.; Sep. 1999; 142p; In English
Report No.(s): AD-A375847; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
The cornerstone of the U.S. Navy's implementation of network centric warfare is the Information Technology for the 21st Century (IT-21) Intranet. The IT-21 Intranet relies on Asynchronous Transfer Mode (ATM) backbones for data transfer. An essential service provided by the IT-21 Intranet is video teleconferencing (VTC). However, the current ATM standard does not support the multipoint-to-multipoint multicast requirements for robust VTC applications. This work builds upon the SMART algorithm, an existing protocol that provides support for ATM multipoint-to-multipoint multicast over a single virtual channel (VCC), and modifies it to ensure that each source has fair access to the VCC. Fair access is ensured to multiple sources through the use of a metric that takes into account the relative magnitude of each source's queue size and cell age. The improved SMART algorithm is modeled using the MIL3's Optimized Network Engineering Tool (OPNET). Fair access to each source is shown using both audio and video source models. VCC utilization is examined and shown to improve for the video case as the number of sources increase. The increased overhead due to the use of Resource Management (RM) cells is also examined.
DTIC
Local Area Networks; Asynchronous Transfer Mode; Algorithms; Computer Networks; Resources Management; Teleconferencing

20000048619 Naval Postgraduate School, Monterey, CA USA
Analysis of Radio Frequency Components for Shipboard Wireless Networks
Matthews, Mark M.; Dec. 1999; 102p; In English
Report No.(s): AD-A375872; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Computers and computer networks are generally viewed as tools that allow personnel to increase productivity. However, due to the limitations of traditional local area networks (LANs), the navy has not been able to efficiently leverage commercial computer technology for general shipboard applications. Recent advances in wireless LANs (WLANs) now permit mobile users to employ network applications to manage and share information. Mobile computers can be used by the crew to supplement damage control reports and reduce the stain on the over-taxed voice circuits. Watchstanders can make log entries into a central data base that utilizes automated data trend analysis algorithms to detect deteriorating components and schedule maintenance to correct the problem prior to component failure. The advantages to using WLANs onboard naval vessels are nearly endless. This thesis evaluates commercially available wireless networking components for use onboard naval vessels. Installing such equipment would enable mobile watchstanders to access services provided on LANs. The theories and principles governing the operation of WLANs are discussed. Then, current commercially available components are evaluated in a laboratory setting. Finally, the most promising component evaluated is tested in the hangarbay of an aircraft carrier and throughout the inhabitable compartments of a Los Angeles class submarine.
DTIC
Local Area Networks; Radio Frequencies; Trend Analysis; Wireless Communication; Navy; Computer Networks

20000048623 Department of the Navy, Washington, DC USA

An Interactive Communication System Permitting Increased Collaboration Between Users

Simonoff, Adam J., Inventor; Apr. 23, 1999; 67p; In English

Patent Info.: Filed 23 Apr. 1999; US-Patent-Appl-SN-09/296,802

Report No.(s): AD-D019622; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A White Board system permitting a plurality of users to collaborate with one another irrespective of the respective user's hardware platform or operating system includes a server computer, and a plurality of client computers electrically coupled to the server computer. Preferably, each of the client computers logs into the server computer and is thereby assigned a unique identifier, each of the client computers includes a graphical user interface (GUI) which selectively displays any combination of objects having active content, active hyperlinks, and text, and each of the client computers transmits user-generated objects to the server computer for storage and selective retransmission to the computers. Additionally, the server stores all user-generated objects from all the client computers and selectively controls transmission of all user-generated objects to respective ones of the computers responsive to the respective assigned identifier.

DTIC

Graphical User Interface; Client Server Systems; Display Devices; Distributed Processing; Data Processing; Patent Applications

20000048627 Department of the Navy, Washington, DC USA

A Method for Facilitating Collaborative Development Efforts Between Widely Dispersed Users

Simonoff, Adam J., Inventor; Apr. 23, 1999; 66p; In English

Patent Info.: Filed 23 Apr. 1999; US-Patent-Appl-SN-09/296,757

Report No.(s): AD-D019626; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A method permitting collaboration between a plurality of users of incompatible hardware and/or operating system, includes steps for selectively generating predetermined objects, text objects, active hyperlink objects, active track objects, and freehand drawing objects, which are displayable at user-selected locations on the White Board screen of one of the users, transmitting all generated ones of the predetermined, the active hyperlink, the text, the active track, and the freehand drawing objects for selective distributions to each of the other users, accumulating the predetermined, the active hyperlink, the text, the active track, and the freehand drawing objects, and filtering the predetermined, the active hyperlink, the text, the active track, and the freehand drawing objects to thereby permit selective transmission of the predetermined, the active hyperlink, the text, the active track, and the freehand drawing objects to respective ones the other users.

DTIC

Patent Applications; Data Processing; Distributed Processing; Client Server Systems

20000048630 Department of the Navy, Washington, DC USA

Method of Sensing Target Status in a Local Area Network

Giorgio, Paul J., Inventor; Amuro, Stephen J., Inventor; Nov. 23, 1999; 12p; In English; Supersedes US-Patent-Appl-SN-08/219555, AD-D016248

Patent Info.: Filed 29 Mar. 1994; US-Patent-5,991,829; US-Patent-Appl-SN-08/219,555

Report No.(s): AD-D019630; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An SCSI controller adapted as a network file server provides a virtual connection between a plurality of host processors and a single SCSI initiator. The controller contains a removable host adapter for connection to any type of network interface. When a host processor issues a command packet and requests status information of a target device, that status information is passed to the requesting processor and subsequently stored in the controller and made available to all other host processors on the network. A fault tolerant performance monitoring algorithm, executing within the controller, is scheduled to non-intrusively and periodically check the status of each SCSI target device and to store that status information for all host processors. The advantage to such a controller is the expanded number of host processor connections to a single SCSI initiator whereby each host processor can independently and logically connect through the controller and SCSI initiator to a target without clearing target status information for other host processors.

DTIC

Local Area Networks; Client Server Systems

20000048631 Department of the Navy, Washington, DC USA

Method of Supplying Multiple Loads From Multiple Sources Over an Interconnected Network of Defined Paths

Prater, Keith A., Inventor; Shimp, Alan G., Inventor; Nov. 23, 1999; 20p; In English; Supersedes US-Patent-Appl-SN-08/876659, AD-D018585

Patent Info.: Filed 19 Jun. 1997; US-Patent-5,991,815; US-Patent-Appl-SN-08/876,659

Report No.(s): AD-D019631; No Copyright; Avail: US Patent and Trademark Office, Microfiche

The method defines a distribution solution for supplying product to a plurality of loads from a plurality of sources via a network of substantially linear path segments that are interconnected at nodes. A combination of minimum spanning trees (MST) and a shortest-path tree (SPT) are applied to the network to from a composite path. The resulting composite path defines a plurality of closed-loop paths in the network. Excluded from consideration in the distribution solution are any of the path segments not included in the composite path. All closed-loop paths are then eliminated by excluding from consideration the one or more path segments having a total weight value that is greatest from each of the closed-loop paths. As a result, a composite tree is defined. The composite tree is then redefined by excluding from consideration in the distribution solution any of the path segments of the composite tree that are not part of a path linking one of the sources to one of the loads. Temporary paths are defined out side of the network to connect the sources. Temporary closed-loop paths are thereby defined by a combination of the temporary paths and the composite tree so-redefined. For each temporary closed-loop path, one or more path segments having a total weight value that is greatest are excluded from consideration in the distribution solution. The distribution solution is defined by remaining ones of the path segments that: (1) have not been so-excluded by any of the previous steps and (2) are part of path linking one of the sources to one of the loads.

DTIC

Feedback Control; Systems Analysis

20000048801 General Accounting Office, Accounting and Information Management Div., Washington, DC USA

Testimony Before the Special Committee on the Year 2000 Technology Problem, U.S. Senate. Year 2000 Computing Challenge: Status of Emergency and State and Local Law Enforcement Systems Is Still Unknown

Apr. 29, 1999; 18p; In English

Report No.(s): PB2000-104228; GAO/T-AIMD-99-163; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

To prepare for this testimony, we reviewed the FCC's March 1999 report on Year 2000 readiness in the communications sector, transcripts of the FCC's emergency services forum held in November 1998, and the April 1999 Network Reliability and Interoperability Council (NRIC) report on Public Safety Answering Positions. We also reviewed available outreach strategies and plans for the Department of Justice and its component bureaus and documentation on actual outreach activities that they have conducted. We discussed with department and bureau officials their respective approaches to managing outreach activities, including outreach goals. Additionally, we attended meetings of the Police/Law Enforcement/Criminal Justice working group, reviewed documents prepared by the working group, and conducted interviews with the Chairman of the group. We performed our work in March and April 1999 in accordance with generally accepted government auditing standards.

NTIS

Computer Networks; Coding; Congressional Reports; Law (Jurisprudence); Governments

20000048802 General Accounting Office, Accounting and Information Management Div., Washington, DC USA

Testimony Before the Subcommittee on Oversight and Investigations and the Subcommittee on Health and Environment, Committee on Commerce, House of Representatives. Year 2000 Computing Crisis: Readiness of Medicare and the Health Care Sector

Apr. 15, 1999; 14p; In English

Report No.(s): PB2000-104224; GAO/T-AIMD-99-146; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

I discuss the immediate effects of the Melissa virus and variations of it as well as its broader implications. I also discuss some critical measures that should be take to help ensure that federal departments and agencies are better prepared for future viruses and other forms of attack.

NTIS

Computer Viruses; Protection; Vulnerability; Congressional Reports; Health; Governments

20000052126 Naval Postgraduate School, Monterey, CA USA

Asynchronous Transfer Mode and Local Area Network Emulation Standards, Protocols, and Security Implications

Kirwin, John P.; Dec. 1999; 149p; In English

Report No.(s): AD-A375842; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

A complex networking technology called Asynchronous Transfer Mode (ATM) and a networking protocol called Local Area Network Emulation (LANE) are being integrated into many naval networks without any security-driven naval configuration guidelines. No single publication is available that describes security issues of data delivery and signaling relating to the transition of Ethernet to LANE and ATM. The thesis' focus is to provide: (1) an overview and security analysis of standardized protocols relating to ATM and LANE; (2) an overview and security analysis associated with integrating a Fore Systems Inc., LANE-based ATM network, with an accredited Cisco Systems Inc., Ethernet Virtual LAN (VLAN) network; and (3) associated security-related suggestions for network design and configurations. This thesis identifies possible negative security-related capabilities associated with ATM- and LANE-related protocols; however, many can be mitigated using the identified network design guidelines. Qualitative analysis suggests that the introduction of an ATM/LANE backbone into an existing TCP/IP network does not increase the probability of incorrect destinations receiving and processing corrupted frames. It is hoped that this seminal document will assist in the development of standard security-driven implementation guidelines associated with ATM/LANE-based networks, as well as inform those required to prepare and review associated network Risk Assessments.

DTIC

Asynchronous Transfer Mode; Local Area Networks; Protocol (Computers); Technology Transfer; Systems Analysis; Computer Information Security

20000052132 Air Force Research Lab., Information Directorate, Rome, NY USA

Data Embedding for Covert Communications, Digital Watermarking, and Information Augmentation, *Aug. - Nov. 1999*

Baldoza, Arnold C.; Mar. 2000; 91p; In English

Contract(s)/Grant(s): Proj-3480

Report No.(s): AD-A375890; AFRL-IF-RS-TR-2000-6; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

This paper introduces data embedding schemes for covert communications, information augmentation, and digital watermarking. Although most digital objects may be used as a container for embedded data, this paper focuses on digital images. It discusses the data embedding framework -- the assumptions made on the communication channel, the issues considered for implementation, and the general requirements imposed on data embedding techniques. The paper presents a number of spatial and spectral data embedding techniques and touches on the general limitations these techniques face. Several application scenarios are presented and the manner in which the data embedding framework is typically tailored and applied to them is proposed.

DTIC

Augmentation; Data Management; Embedding; Pulse Communication

20000052249 Space and Naval Warfare Systems Center, San Diego, CA USA

Online Monitoring of Oils in Wastewater Using Combined Ultraviolet Fluorescence and Light Scattering with an Artificial Neural Network *Final Report*

He, L. M.; Kear-Padilla, L. L.; Lieberman, S. H.; Andrews, J. M.; Feb. 2000; 44p; In English; Prepared in collaboration with San Diego State Univ. Foundation, San Diego, CA., and Computer Sciences Corp., Moorestown, NJ.

Report No.(s): AD-A375432; TR-1816; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ultraviolet (UV) fluorescence and light scattering are two analytical methods commonly used in instrumentation for online measurement of oils in water. UV fluorescence-based instruments detect both dissolved and emulsified aromatic constituents of oils. Light-scattering-based sensors measure optical scattering induced by emulsified oil droplets. A major technical challenge for each of these methods is to maintain quantitative accuracy in the presence of chemical and physical interferences, including fluorescent organic compounds (e.g., detergents and natural organic matter), suspended solid particles, dissolved salts, etc. to address this issue, we have been developing a new monitoring system that simultaneously combines both UV fluorescence and light scattering spectroscopy. Four major types of oils (lube oil 2190 and 9250, diesel fuel marine, and WS), each of which had a dozen subtypes of oil samples, were examined to obtain the intensity of both fluorescence and scattering as a function of oil, detergent (Mil-D and Tide), and seawater concentrations. Both fluorescence and light scattering intensities varied significantly with oil types and subtypes. Both Mil-D and Tide greatly influenced the fluorescence and scattering of oil samples.

DTIC

On-Line Systems; Oils; Waste Water; Ultraviolet Radiation; Fluorescence; Light Scattering; Neural Nets; Artificial Intelligence

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also 54 Man/System Technology and Life Support.

20000048390 Astro Aerospace Corp., Carpinteria, CA USA
Friction Drive Characteristics for the Space Station Mobile Transporter
Hughes, Richard C., Astro Aerospace Corp., USA; Hoyt, Daniel E., Astro Aerospace Corp., USA; Carreras, Juan L., Boeing Co., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 117-130; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

A friction drive system for translation along the truss structure of the International Space Station is described. All development, qualification and acceptance testing of the design has been completed and the flight article is undergoing integrated element testing in preparation for a launch in 2001. A discussion of the mechanical design, materials selection and test program is presented along with lessons learned.
Author
Space Stations; Space Station Structures; Mobility; Transporter; Trusses

20000048819 Electronics Research Lab., Salisbury, Australia
Representing Uncertainties Using Bayesian Networks
Das, Balaram, Electronics Research Lab., Australia; Dec. 1999; 66p; In English
Report No.(s): AD-A375827; DSTO-TR-0918; DODA-AR-011-177; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This report demonstrates the application of Bayesian networks for modelling and reasoning about uncertainties. A scenario for naval anti-surface warfare is constructed and Bayesian networks are used to represent and update uncertainties encountered in the process of situation assessment. Concepts from information theory are used to provide a measure of uncertainty and understand its flow in a Bayesian network. This in turn yields analytical methods to formulate various effectiveness measures.
DTIC
Bayes Theorem; Information Theory; Models; Command and Control

20000050266 University of Electro-Communications, Tokyo, Japan
Active Robust Control for Linear Systems with Norm-Bounded Parameter Uncertainty
Maki, Midori, University of Electro-Communications, Japan; Hagino, Kojiro, University of Electro-Communications, Japan; Bulletin of the University of Electro-Communications; December 1999; ISSN 0915-0935; Volume 12, No. 2, pp. 127-133; In English; Copyright; Avail: British Library Lending (BLL) Division, Boston Spa, England

In this paper, we developed a composite control law for linear systems with norm-bounded time-varying parameter uncertainties, which consists of a basic linear robust control designed so as to generate a desired transient time-response for a typical pattern of worst-case parameter trajectories and a nonlinear modification term designed so as to reduce the passivity of the linear robust control in an adaptive manner. The proposed ”active robust” controller is established such that the reduction of passivity of the linear robust control is well incorporated into the achievement of a good transient behavior.
Author
Robustness (Mathematics); Linear Systems; Control Theory; Transient Response; Time

20000050273 Department of the Navy, Washington, DC USA
Classification System and Method Using Combined Information Testing
Lynch, Robert S., Jr., Inventor; Willett, Peter K., Inventor; Dec. 07, 1999; 11p; In English; Supersedes US-Patent-Appl-SN-08/858186
Patent Info.: Filed 2 May 1997; US-Patent-5,999,893; US-Patent-Appl-SN-08/858,186
Report No.(s): AD-D019638; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A classification system uses sensors to obtain information from which features which characterized a source or object to classified can be extracted. The features are extracted from the information and compiled into a feature vector which is then quantized to one of one of M discrete symbols. After N feature vectors have been quantized, a test vector having components which are defined by the number of occurrences of each of the M symbols in N the quantized vectors is built. The system combines the test vector with training data to simultaneously estimate symbol probabilities for each class and classify the test vector using a decision

rule that depends only on the training and test data. The system classifies the test vector using either a Combined Bayes test or a Combined Generalized likelihood ratio test.
DTIC
Classifications; Information Systems; System Identification; Patents

20000051524 Massachusetts Inst. of Tech., Lab. of Electronics, Cambridge, MA USA
Training Spatial Knowledge Acquisition Using Virtual Environments ***Annual Report, 1 Feb. 1999-31 Jan. 2000***
Durlach, Nathaniel I.; von Wiegand, Thomas E.; Brooks, Andrew; Madden, Sam; Delhorne, Lorraine; Apr. 03, 2000; 120p; In English
Contract(s)/Grant(s): N00014-96-1-0379; Proj-3143
Report No.(s): AD-A375651; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This report summarizes the work done by MIT in Year 4 (1 February 1999 through 31 January 2000) of the ONR Grant N00014-96-1-0937 entitled ”Training Spatial Knowledge Acquisition Using Virtual Environments.” It has been prepared by Nathaniel Durlach (PI), Dr. Thomas E. von Wiegand, Andrew Brooks, Sam Madden, Lorraine Delhorne and Rebecca Lee Garnett.
DTIC
Education; Knowledge Based Systems; Knowledge Bases (Artificial Intelligence); Artificial Intelligence; Virtual Reality; Environment Simulation; Computerized Simulation

20000052251 Yale Univ., Dept. of Electrical Engineering, New Haven, CT USA
Intelligent Control of Uncertain Systems ***Final Report, 1 Apr. 1997-31 Dec. 1999***
Morse, A. S.; Mar. 20, 2000; 10p; In English
Contract(s)/Grant(s): F49620-97-1-0108
Report No.(s): AD-A375427; AFRL-SR-BL-TR-00-0079; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The main objective of this research has been to advance the state-of-the-art in smart control design methodology for the purpose of regulating or otherwise controlling very poorly modeled nonlinear processes. The objective has been approached by examining and modifying a variety hybrid switching control strategies. An important connection is made between the heuristic idea of certainty equivalence and the detectability of an adaptive control system. This observation together with the development of two new switching strategies has yielded provably correct adaptive control techniques applicable to a wide range of problems of practical importance. Among these are methods for automatically calibrating vision-based control systems, for controlling highly uncertain nonholonomic systems, for robustly suppressing from the output of a control system the effect of a disturbance signal consisting of a finite number of sinusoids of unknown frequencies, and for controlling induction motors with uncertain resistances such as those used on TGV trains.
DTIC
Adaptive Control; Control Systems Design; Induction Motors; Control Theory

20000052445 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
The Evaluation of Competing Classifiers
Alsing, Stephen G.; Mar. 2000; 162p; In English
Report No.(s): AD-A375294; AFIT/DS/ENS/00-01; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
This dissertation research makes contributions towards the objective evaluation of competing classifiers, i.e., classification systems (CSs) or pattern recognition algorithms. Automatic CSs have been under development for almost 40 years in a wide range of military and medical applications. During this period, scientists and engineers have developed extensive theory and algorithms for classification, but by comparison have focused little on the testing and evaluation of their systems. Classifier evaluation is very important in the fields of automatic target recognition (ATR) and pilot workload classification. In order for military operators to be confident in new CSs, they must have an objective way of testing and evaluating competing systems.
DTIC
Classifications; Pattern Recognition; Target Recognition; Algorithms

20000052457 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
ELIPS: Toward a Sensor Fusion Processor on a Chip
Daud, Taher, Jet Propulsion Lab., California Inst. of Tech., USA; Stoica, Adrian, Jet Propulsion Lab., California Inst. of Tech., USA; Tyson, Thomas, Jet Propulsion Lab., California Inst. of Tech., USA; Li, Wei-te, Jet Propulsion Lab., California Inst. of Tech., USA; Fabunmi, James, Jet Propulsion Lab., California Inst. of Tech., USA; [1998]; 11p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper presents the concept and initial tests from the hardware implementation of a low-power, high-speed reconfigurable sensor fusion processor. The Extended Logic Intelligent Processing System (ELIPS) processor is developed to seamlessly combine rule-based systems, fuzzy logic, and neural networks to achieve parallel fusion of sensor in compact low power VLSI. The first demonstration of the ELIPS concept targets interceptor functionality; other applications, mainly in robotics and autonomous systems are considered for the future. The main assumption behind ELIPS is that fuzzy, rule-based and neural forms of computation can serve as the main primitives of an ”intelligent” processor. Thus, in the same way classic processors are designed to optimize the hardware implementation of a set of fundamental operations, ELIPS is developed as an efficient implementation of computational intelligence primitives, and relies on a set of fuzzy set, fuzzy inference and neural modules, built in programmable analog hardware. The hardware programmability allows the processor to reconfigure into different machines, taking the most efficient hardware implementation during each phase of information processing. Following software demonstrations on several interceptor data, three important ELIPS building blocks (a fuzzy set preprocessor, a rule-based fuzzy system and a neural network) have been fabricated in analog VLSI hardware and demonstrated microsecond-processing times.
Author
Very Large Scale Integration; Neural Nets; Computation; Data Processing; Fuzzy Systems; Intelligence; Logic Circuits; Multisensor Fusion

20000052494 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Cascade Error Projection with Low Bit Weight Quantization for High Order Correlation Data
Duong, Tuan A., Jet Propulsion Lab., California Inst. of Tech., USA; Daud, Taher, Jet Propulsion Lab., California Inst. of Tech., USA; [1998]; 7p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In this paper, we reinvestigate the solution for chaotic time series prediction problem using neural network approach. The nature of this problem is such that the data sequences are never repeated, but they are rather in chaotic region. However, these data sequences are correlated between past, present, and future data in high order. We use Cascade Error Projection (CEP) learning algorithm to capture the high order correlation between past and present data to predict a future data using limited weight quantization constraints. This will help to predict a future information that will provide us better estimation in time for intelligent control system. In our earlier work, it has been shown that CEP can sufficiently learn 5-8 bit parity problem with 4- or more bits, and color segmentation problem with 7- or more bits of weight quantization. In this paper, we demonstrate that chaotic time series can be learned and generalized well with as low as 4-bit weight quantization using round-off and truncation techniques. The results show that generalization feature will suffer less as more bit weight quantization is available and error surfaces with the round-off technique are more symmetric around zero than error surfaces with the truncation technique. This study suggests that CEP is an implementable learning technique for hardware consideration.
Author
Errors; Quantitative Analysis; Data Correlation; Low Weight

20000052513 Army Armament Research, Development and Engineering Center, Close Combat Armaments Center, Watervliet, NY USA
Dynamic Scaling in Cellular Automata Simulations of Deposition Processes ***Final Report***
Johnson, Mark; Mar. 2000; 18p; In English
Report No.(s): AD-A375200; ARCCB-TR-00004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cellular automata simulations can be used to capture many of the essential features of processes that are difficult to model. They are particularly useful in the study of nonlinear dynamical systems that have complex continuous solutions. In this study, cellular automata models have been employed to investigate the nature of the vapor deposition process by exploring the natural evolution of dynamical dissipative systems using self-organized critical system analysis and spatial scaling measures. A new numerical technique is introduced to analyze the intrinsic structure of evolving surface topography in an effort to better understand the dynamics of the growth processes. This technique is being used to validate the integrity of deposition models through a comparative analysis with experimental data and to determine if a correlation exists between intrinsic surface structure and parameters controlling the deposition process.
DTIC
Nonlinear Systems; Dynamical Systems; Automata Theory; Image Processing; Systems Analysis

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20000048805 Technische Hogeschool Twente, Faculty of Applied Mathematics, Enschede, Netherlands
Analysis of Random Walks Using Orthogonal Polynomials
vanDoorn, E. A., Technische Hogeschool Twente, Netherlands; Schrijner, P., Durham Univ., UK; Feb. 1998; 22p; In English
Report No.(s): PB2000-103732; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The authors discuss some aspects of discrete-time birth-death processes or random walks, highlighting the role played by orthogonal polynomials.
NTIS
Death; Birth; Statistical Distributions

20000051527 Army Research Lab., Sensors Directorate, Adelphi, MD USA
Natural Computing: Analysis of Graphs for Computer Representation ***Final Report, 1995-1997***
Karamchetty, Som; Feb. 2000; 39p; In English
Report No.(s): AD-A375557; ARL-TR-2042; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Some fundamental objects in practical documents have not been implemented in software so that they can be used easily for calculation. One such object is the graph. A survey of practical graphs found in a variety of real-world documents reveals that many of their useful features are not captured in software. I describe the salient characteristics and features of graphs and propose data structures and computer representations for graph objects. Through the adoption of such structures and representations, practical graph objects could be developed for use by domain specialists. Such graphs embedded in electronic documents can be used in interactive applications to retrieve data, but most importantly, they could be used as functional representations for ”cutting and pasting” in procedures and programs. Use of these graph objects, together with other natural computing objects (such as equations, tables, and procedures), will permit electronic documents like handbooks, textbooks, journals, and bulletins to be used seamlessly for calculations by both domain specialists and naive users. Such developments will reduce the lag between information availability and its use in calculations, encouraging the further development of knowledge. The face of software development for computation will change, and many of the software engineering costs will be contained.
DTIC
Software Engineering; Computerized Simulation; Data Structures; Object-Oriented Programming

20000052499 NASA Langley Research Center, Hampton, VA USA
Determining a Prony Series for a Viscoelastic Material From Time Varying Strain Data
Tzikang, Chen, Army Research Lab., USA; May 2000; 26p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 706-13-31-01
Report No.(s): NASA/TM-2000-210123; NAS 1.15:210123; ARL-TR-2206; L-17978; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this study a method of determining the coefficients in a Prony series representation of a viscoelastic modulus from rate dependent data is presented. Load versus time test data for a sequence of different rate loading segments is least-squares fitted to a Prony series hereditary integral model of the material tested. A nonlinear least squares regression algorithm is employed. The measured data includes ramp loading, relaxation, and unloading stress-strain data. The resulting Prony series which captures strain rate loading and unloading effects, produces an excellent fit to the complex loading sequence.
Author
Prony Series; Strain Rate; Load Tests; Regression Analysis; Stress-Strain Relationships; Viscoplasticity; Data Integration; Weighting Functions

20000052501 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
On the combined performance of non-local artificial boundary conditions with the new generation of advanced multigrid flow solvers ***Final Report***
Roberts, T. W., NASA Langley Research Center, USA; Sidilkover, D., Institute for Computer Applications in Science and Engineering, USA; Tsynkov, S. V., Institute for Computer Applications in Science and Engineering, USA; April 2000; 43p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2000-210115; NAS 1.26:210115; ICASE-2000-21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We develop theoretically and implement numerically a unified flow solution methodology that combines the advantages relevant to two independent groups of methods in CFD that have recently proven successful. The new factorizable schemes for the equations of hydrodynamics that facilitate the construction of optimally convergent multigrid algorithms, and highly accurate global far-field artificial boundary conditions (ABCs). The primary result that we have obtained is the following. Global ABCs do not hamper the optimal (i.e., unimprovable) multigrid convergence rate pertinent to the solver. At the same time, contrary to the standard local ABCs, the solution accuracy provided by the global ABCs deteriorates very slightly or does not deteriorate at all when the computational domain shrinks, which clearly translates into substantial savings of computer resources.
Author
Multigrid Methods; Computational Fluid Dynamics; Incompressible Flow; Compressible Flow; Hydrodynamic Equations; Fourier Transformation; Conformal Mapping; Navier-Stokes Equation

20000052506 Technische Univ., Faculty of Mathematical Sciences, Twente, Netherlands
Linear Approach to Shape Preserving Spline Approximation
Kuijt, F.; vanDamme, R. M. J.; Jul. 1998; ISSN 0169-2690; 28p; In English
Report No.(s): PB2000-103767; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report deals with approximation of a given scattered univariate or bivariate data set that possesses certain shape properties, such as convexity, monotonicity, and/or range restrictions. The data are approximated for instances by tensor-product B-splines preserving the shape characteristics present in the data. Shape preservation of the spline approximant is obtained by additional linear constraints. Constraints are constructed which are local linear sufficient conditions in the unknowns for convexity or monotonicity. In addition, it is attractive if the objective function of the minimization problem is also linear, as the problem can be written as a linear programming problem then. A special linear approach based on constrained least squares is presented, which reduces the complexity of the problem in case of large data sets in contrast with l(sub infinity) and the l(sub 1)-norms. An algorithm based on iterative knot insertion which generates a sequence of shape preserving approximants is given. It is investigated which linear objective functions are suited to obtain an efficient knot insertion method.
NTIS
Approximation; Linear Programming; Monotone Functions; Spline Functions

20000052507 Technische Univ., Faculty of Mathematical Sciences, Twente, Netherlands
Note on a Reconstruction Problem for Number Sequences
Goebel, F.; Jul. 1998; ISSN 0169-2690; 10p; In English
Report No.(s): PB2000-103766; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The authors consider the following problem: for which values of n can the sequence a(sub 1),...,a(sub n) of real numbers be reconstructed (up to order) from the sequence S(sub 1),...,S(sub m) of the sums a(sub i) + a(sub j) (1 less than or + i less than j less than or + n, m = ((sup n)(sub 2))). The answer is positive for n = 3, 5, 6, and its negative for n = 2(sup k) (k greater than or = 0).
NTIS
Reconstruction; Sequencing; Analysis (Mathematics)

20000052508 Technische Univ., Faculty of Mathematical Sciences, Twente, Netherlands
Shape Preserving C(2) Interpolatory Subdivision Schemes
Kuijt, F.; vanDamme, R.; Aug. 1998; ISSN 0169-2690; 24p; In English
Report No.(s): PB2000-103765; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Stationary interpolatory subdivision schemes which preserve shape properties such as convexity or monotonicity are constructed. The schemes are rational in the data and generate limit functions that are at least C(sup 2), The emphasis is on a class of six-point convexity preserving subdivision schemes that generate C(sup 2) limit functions. In addition, a class of six-point monotonicity preserving schemes that also leads to C(sup 2) limit functions is introduced. As the algebra is far too complicated for an analytical proof of smoothness, validation had been performed by a simple numerical methodology.
NTIS
Subdivisions; Interpolation; Monotone Functions; Numerical Analysis

20000052509 Technische Univ., Faculty of Mathematical Sciences, Twente, Netherlands
All Solutions of the Algebraic Riccati Equation for the Wave Equation
Kuiper, C. R.; Zwart, H. J.; Aug. 1998; ISSN0169-2690; 24p; In English
Report No.(s): PB2000-103764; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The construction of the optimal control for a linear system with a know quadratic cost functional is done via the (unique) positive solution of the associated algebraic Riccati equation. However, the algebraic Ricatti equation has many more solutions. In this report the authors construct all solutions for a specific algebraic Riccati equation. The algebraic Riccati equation that the authors study, is the one associated with the undamped wave equation with cost-criterion the total input energy plus the total kinetic energy.
NTIS
Wave Equations; Riccati Equation; Algebra; Optimal Control

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

20000052262 Naval Research Lab., Washington, DC USA
A Study of Adaptive Detection of Range-Distributed Targets
Gerlach, Karl; Steiner, M. J.; Mar. 27, 2000; 29p; In English
Contract(s)/Grant(s): Proj-LR021-05-RH
Report No.(s): AD-A375305; NRL/MR/5340--00-8438; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A Modified Generalized Likelihood Ratio Test (MGLRT) for the adaptive detection of a target or targets that are distributed in range is derived. The unknown parameters associated with the hypothesis test are the complex amplitudes in range of the desired target and the unknown covariance matrix of the additive interference, which is assumed to be characterized as complex zero-mean correlated Gaussian random variables. The target's or targets' complex amplitudes are assumed to be distributed across the entire input data block (sensor x range). Results on probabilities of false alarm and detection are derived and a Constant False Alarm Rate (CFAR) detector is developed. Simulation results are presented. It is shown that the derived MGLRT of range- distributed targets is much more effective in detecting targets distributed in range than an M out of K detector that is cascaded with a single-point target Kelly detector. In addition, the MGLRT associated with detecting a single point target with signal-contaminated secondary data is also derived. It is shown, surprisingly, that this detector is totally ineffective in solving this problem.
DTIC
Likelihood Ratio; Probability Theory; False Alarms; Target Recognition; Radar Targets

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20000048804 Technische Hogeschool Twente, Faculty of Applied Mathematics, Enschede, Netherlands
Core of Ordered Submodular Cost Games
Faigle, Ulrich, Technische Hogeschool Twente, Netherlands; Kern, Walter, Technische Hogeschool Twente, Netherlands; Oct. 1997; 26p; In English
Report No.(s): PB2000-103743; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
A general order theoretic linear programming model for the study of matroid-type greedy algorithms is introduced. The primal restrictions are given by so-called weakly increasing submodular functions on antichains. The LP-dual is solved by a Monge-type greedy algorithm. The model offers a direct combinatorial explanation for many integrality results in discrete optimization. In particular, the submodular intersection theorem of Edmonds and giles is seen for the case with a rooted forest as underlying structure. The core of associated polyhedra is introduced and applications to the existence of the core in cooperative game theory are discussed.
NTIS
Game Theory; Combinatorial Analysis; Linear Programming; Algorithms; Mathematical Models

20000051532 Wisconsin Univ., Dept. of Computer Sciences, Madison, WI USA
The Semismooth Algorithm for Large Scale Complementarity Problems
Munson, Todd S.; Facchinei, Francisco; Ferris, Michael C.; Fischer, Andreas; Kanzow, Christian; Jun. 1999; 25p; In English; Prepared in cooperation with Dortmund Univ., Dept. of Mathematics, Dortmund, Germany, Hamburg Univ., Inst. of Applied Mathematics, Hamburg, Germany, and Roma Univ., Dipartimento di Informatica e Sistemistica, Italy.
Contract(s)/Grant(s): F49620-98-1-0417; NSF-CCR96-19765
Report No.(s): AD-A375452; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Complementarity solvers are continually being challenged by modelers demanding improved reliability and scalability. Building upon a strong theoretical background the semismooth algorithm has the potential to meet both of these requirements. We briefly discuss relevant theory associated with the algorithm and describe a sophisticated implementation in detail. Particular emphasis is given to robust methods for dealing with singularities in the linear system and to large scale issues. Results on the MCPLIB test suite indicate that the code is robust and has the potential to solve very large problems.
DTIC
Algorithms; Mathematical Programming

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.

20000048806 Technische Hogeschool Twente, Faculty of Applied Mathematics, Enschede, Netherlands
Energy-Based Lyapunov Functions for Forced Hamiltonian Systems with Dissipation
Maschke, B., Conservatoire National des Arts et Metiers, France; Ortega, R., SUPELEC, France; VanDerSchaft, A. J., SUPELEC, France; Apr. 1998; 24p; In English
Report No.(s): PB2000-103728; Memorandum-1435; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

It is well known that the total energy is a suitable Lyapunov function to study the stability of the trivial equilibrium of an isolation standard Hamiltonian system. In many practical instances, however, the system is in interaction with its environment through some constant forcing terms. This gives rise to what the authors call forced Hamiltonian systems, for which the equilibria of interest are now different from zero. When the system is linear a Lyapunov function can be immediately obtained by simply shifting the coordinates in the total energy. However, for nonlinear systems there is no guarantee that this incremental energy is, no even locally, a Lyapunov function. In this paper the authors propose a constructive procedure to modify the total energy function of forced Hamiltonian systems with dissipation in order to generate Lyapunov functions for non-zero equilibria. A key step in the procedure, which is motivated from energy-balance considerations standard in network modeling of physical systems, is to embed the system into a larger Hamiltonian system for which a series of Casimir functions can be easily constructed.
NTIS
Dissipation; Liapunov Functions; Hamiltonian Functions

20000051483 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Counting Horoballs and Rational Geodesics
Hersonsky, S.; Paulin, F.; Dec. 1999; 14p
Report No.(s): PB2000-103809; IHES/M/99/86; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Let M be a geometrically finite pinched negatively curved Riemannian manifold with at least one cusp. The authors study the asymptotics of the number of geodesics in M starting from and returning to a given cusp, and of the number of horoballs at parabolic fixed points in the universal cover of M.
NTIS
Rational Functions; Geodesic Lines; Counting

20000052491 Technische Hogeschool Twente, Faculty of Mathematical Sciences, Enschede, Netherlands
Localization of Solutions of Exterior Domain Problems for the Porous Media Equation with Radial Symmetry
Gilding, B. H.; Goncerzewicz, J.; Jun. 1998; 46p; In English
Report No.(s): PB2000-103769; No Copyright; Avail: National Technical Information Service (NTIS)

The paper concerns the radially-symmetric Cauchy-Dirichlet and Cauchy-Neumann problems for the porous media equation in the domain comprising the spatial variable and the temporal variable t in the exterior of the unit ball in R(sup n) and the bounded interval (0, T) respectively. The subject of study is the behavior of solutions when the initial data are compactly supported and

the boundary data become unbounded as t(up arrow)T. Necessary and sufficient conditions for localization, estimates of the size of the blow-up set, and a number of related results are obtained.
NTIS
Problem Solving; Position (Location)

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see categories 71 through 77. For related instrumentation see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

20000044896 Rutherford Appleton Lab., Chilton, UK
Magnetic Roughness and Domain Correlations in Antiferromagnetically Coupled Multilayers
Marrows, C. H., Leeds Univ., UK; Dekadjevi, D. T., Leeds Univ., UK; Hickey, B. J., Leeds Univ., UK; Langridge, S., Rutherford Appleton Lab., UK; Schmalian, J., Rutherford Appleton Lab., UK; ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 42-43; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Much of modern solid-state technology relies on ultrathin film structures, and the characterisation of buried interfaces within these represents a considerable experimental challenge. For structurally rough interfaces diffuse X-ray scattering is the most appropriate technique and advanced theories exist to analyse the scattering and to interpret it in terms of the interface morphology. A new and important class of electronic devices rely on spin-dependent transport in magnetic layered structures - the burgeoning field of so-called spin electronics. The study of the 'magnetic roughness' in these films is then extremely useful in interpreting the magnetoelectronic properties of such devices. In the work described here the CRISP reflectometer has been used to measure the diffuse magnetic neutron scattering from such magnetic nanolayered structures.
Author
Correlation; Antiferromagnetism; Magnetization

20000048625 Department of the Navy, Washington, DC USA
Structures with Improved Magnetic Characteristics for Giant Magneto-Resistance Applications
Bussmann, Konrad, Inventor; Lubitz, Peter, Inventor; Cheng, Shufan, Inventor; Oct. 27, 1998; 21p; In English
Patent Info.: Filed 27 Oct. 1998; US-Patent-Appl-SN-09,179,095
Report No.(s): AD-D019624; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A GMR stack has at least two ferromagnetic layers (e.g., CoFe) spaced from each other by a nonferromagnetic layer (e.g., Cu). A layer of a phase-breaking material (such as Ta or a Ta-base alloy) between, the nonferromagnetic layer and at least one of the two ferromagnetic layers prevents the undesirable growth of large-grained structures in the ferromagnetic layers
DTIC
Magnetic Properties; Ferromagnetic Materials; Magnetoresistivity; Patent Applications

20000051529 Wisconsin Univ., Dept. of Computer Sciences, Madison, WI USA
Limit Analysis of Frictional Block Assemblies as a Mathematical Program With Complementarity Constraints
Ferris, M. C.; Tin-Loi, F.; Feb. 15, 1999; 24p; In English; Prepared in cooperation with New South Wales Univ., School of Civil and Environmental Engineering, Sydney, Australia
Report No.(s): AD-A375513; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The computation of the collapse loads of discrete rigid block systems, characterized by frictional (nonassociative) and tensionless contact interfaces, is formulated and solved as a special constrained optimization problem known as a Mathematical Program with Equilibrium Constraints (MPEC). In the present instance, some of the essential constraints are defined by a complementarity system involving the orthogonality of two sign-constrained vectors. Due to its intrinsic complexity, MPECs are computationally very hard to solve. In this paper, we investigate a simple numerical scheme, involving appropriate relaxation of the complementarity term, to solve this nonstandard limit analysis problem. Some computational results are presented to illustrate potentialities of the method.
DTIC
Friction Factor; Friction; Nonlinear Programming

20000051534 Wisconsin Univ., Dept. of Computer Sciences, Madison, WI USA
Complementarity Problems in Engineering Mechanics: Models and Solution
Tin-Loi, F.; Ferris, M. C.; Jan. 1999; 9p; In English; Prepared in cooperation with New South Wales Univ., School of Civil and Environmental Engineering, Sydney, Australia.
Report No.(s): AD-A375444; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A large class of problems in engineering mechanics involves a so-called ”complementarity” relationship representing the orthogonality of two sign-constrained vectors. Typical instances are plasticity laws and contact-like conditions. For state problems, the formulation leads to a mixed complementarity problem (MCP) whereas in synthesis (e.g. minimum weight design) or identification problems, a mathematical program with equilibrium constraints (MPEC) is obtained. The aim of this paper is twofold. Firstly, it describes, through two typical models, how some important engineering mechanics problems can be formulated elegantly and naturally as either an MCP or an MPEC. Secondly, it describes a powerful computer-oriented environment for constructing and solving these mathematical programming problems, with features such as sparsity and automatic differentiation facilities being transparently accessible. This involves the use of the modeling language GAMS (an acronym for General Algebraic Modeling System) and its associated mathematical programming solvers (e.g. the industry standard MCP solver PATH). A simple generic model suitable for solving the state problem for trusses is used to clarify the syntax of GAMS models and to illustrate the ease with which they can be built and solved.
DTIC
Mechanical Engineering; Continuum Mechanics; Mathematical Programming; Plastic Properties

20000051535 Iowa Univ., Iowa City, IA USA
The Effects of Impurities on Junction Behavior in High-Temperature Superconductors ***Annual Report, 5 Mar. 1999-4 Mar. 2000***
Flatte, Michael E.; Mar. 01, 2000; 34p; In English
Contract(s)/Grant(s): N00014-99-1-0313
Report No.(s): AD-A375443; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is a report on the progress in theoretical calculations of scanning tunneling microscopy spectra near impurities in superconductors. Calculations have been performed for Zn and Ni impurities in BSCCO, and compared with recent scanning tunneling microscopy spectra near those impurities. Good quantitative agreement has been found. The Zn atom appears to locally destroy superconductivity. New experiments involving two Ni atoms and a Ni and Zn atom have been proposed to clarify the range of this effect from Zn, and also to observe the spin-spin correlation function in the superconducting state.
DTIC
Impurities; Semiconductor Junctions; BSCCO Superconductors; Superconducting Films

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ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see 45 Environment Pollution. For aircraft noise see also 02 Aerodynamics and 07 Aircraft Propulsion Propulsion and Power.

20000044881 NASA Ames Research Center, Moffett Field, CA USA
Summary of HEAT 1 Aeroacoustics Installation Effects
Smith, Brian E., NASA Ames Research Center, USA; Zuniga, Fanny A., NASA Ames Research Center, USA; Soderman, Paul T.; First NASA/Industry High-Speed Research Configuration Aerodynamics Workshop; December 1999, Part 3, pp. 1407-1452; In English; See also 20000044865; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

A critical part of the NASA High-Speed Research (HSR) program is the demonstration of satisfactory suppression of the jet noise present at low airspeeds. One scheme for reducing jet exhaust noise generated by a future High-Speed Civil Transport (HSCT) is the use of a mixer/ ejector system which would entrain large quantities of ambient air into the exhaust flow from the powerplant in order to cool and slow the jet exhaust before it leaves the tailpipe. of the variety of factors which can affect the noise suppression characteristics of the mixer/ejector system, the influence of the wing flow field and high-lift devices is not well understood. The effectiveness of the noise suppression device must be evaluated in the presence of the wing/high-lift system before definitive assessments can be made concerning HSCT noise. Of nearly equal importance is the evaluation of the performance of the high-lift system(s) in the presence of realistic propulsion units which feature high ambient flow entrainment rates and jet thrust coefficients. These noise suppressors must provide the required acoustic attenuation while not overly degrading the thrust efficiency of the propulsion system or the lift enhancement of the high-lift devices on the wing. The overall objective of the NASA

High-lift Engine Aeroacoustics Technology program is to demonstrate satisfactory interaction between the jet noise suppressor and the high-lift system at airspeeds and angles of attack consistent with takeoff, climb, approach, and landing. In support of this program, an isolated aeroacoustic test of a 13.5%-scale, candidate mixer/ejector nozzle was performed in the Ames' Research Center 40- by 80-Foot Wind Tunnel. The purpose of the test was to measure the baseline aeroacoustic performance characteristics of this nozzle in isolation from the aerodynamic flowfield induced by an HSCT airframe. The test documented the acoustic signature of the nozzles with treated and hardwall ejector surfaces and with changes in the ratio of ejector-duct-to-jet-area over a wide range range of nozzle pressure ratios and freestream Mach numbers. The test also measured the thrust performance, ambient-flow aspiration ratio, and internal and external static pressures on the nozzles. The isolated aeroacoustic performance data has been compared with results obtained with this nozzle installed on a 13.5% Boeing Reference H HSCT configuration, semi-span model. The semi-span, aeroacoustics integration test documented the first-order effects of the airframe flowfield on the acoustic performance of the nozzle and the effect of the nozzle secondary inlet flows on the aerodynamic performance of the wing high-lift systems. This investigation is critical to understanding the mutual installation effects of mixer/ejector nozzles and wing high-lift systems.
Derived from text
Acoustic Attenuation; Acoustic Properties; Aeroacoustics; Jet Aircraft Noise; Aerodynamic Noise; Noise Reduction; Mixers; Ejectors; Nozzle Flow; Exhaust Nozzles; Wind Tunnel Tests

20000045694 NASA Kennedy Space Center, Cocoa Beach, FL USA
Use of Ultrasound to Improve the Effectiveness of a Permeable Treatment Wall
Quinn, Jacqueline W., Inventor, NASA Kennedy Space Center, USA; Clausen, Christian A., Inventor, NASA Kennedy Space Center, USA; Geiger, Cherie L., Inventor, NASA Kennedy Space Center, USA; Reinhart, Debra R., Inventor, NASA Kennedy Space Center, USA; Ruiz, Nancy, Inventor, NASA Kennedy Space Center, USA; Jan. 11, 2000; 12p; In English
Patent Info.: Filed 31 Jul. 1997; NASA-Case-KSC-11959; US-Patent-6,013,232; US-Patent-Appl-SN-904028; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A method for increasing the effectiveness of a permeable treatment wall is described. The method includes the introduction of ultrasonic radiation in or near the wall. A permeable treatment wall is also described which has an ultrasonic radiation generating transducer in or near the wall. Permeable treatment walls are described as having either a well vertically extending into the wall, or a rod vertically extending into the treatment wall. Additionally, a method for adapting a permeable treatment wall to allow for the introduction of ultrasonic radiation in or near the wall is described.
Author
Walls; Ultrasonic Radiation; Permeability; Surface Treatment

20000046622 Washington Univ., Applied Physics Lab., Seattle, WA USA
Effects of Interaction between Two Bubble Scatterers ***Final Report, 1 Oct. 1995-31 Dec. 1998***
Kapodistrias, George; Dahl, Peter H.; Mar. 03, 2000; 30p; In English
Contract(s)/Grant(s): N00014-96-1-0122
Report No.(s): AD-A375668; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The backscattering of sound from two regularly arranged bubbles is studied theoretically and experimentally. In wall-controlled laboratory experiments a bistatic acoustic system is used to interrogate the scatterers, which are placed on a very fine thread at the same distance d from the combined beam axis of the set of transmitting and receiving transducers. The radius of each bubble is 585 micrometers. The frequency range is 80-140 kHz, and d is varied so that the variable kd spans the range 0.2-21, where k is the acoustic wave number. Scattering calculations are carried out using an exact, closed-form solution derived from the multiple scattering series. Several experiments are performed, and the results are in close agreement with the calculations. It is verified that multiple scattering induces an oscillatory behavior about the exact coherent scattering level, with decreasing amplitude for increasing kd. For interbubble distance 2d = lambda/2 the backscattered radiation is maximized, while for 2d is less than lambda/2 the radiation is reduced considerably. These and other effects are discussed.
DTIC
Bubbles; Acoustic Scattering; Coherent Scattering; Backscattering

20000046723 Department of the Navy, Washington, DC USA
Method and Apparatus for Simulating a Lofargram in a Multipath Sonar System
Weinberg, Henry, Inventor; Nov. 02, 1999; 38p; In English; Supersedes US-Patent-Appl-SN-08891365, AD-D018756.
Patent Info.: Filed 10 Jul. 1997; US-Patent-Appl-SN-08,891,365; US-Patent-5,978,646
Report No.(s): AD-D019647; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method and apparatus for simulating a lofargram in a multipath sonar system is provided. The invention includes an input means for providing a plurality of simulated sonar system parameters. A defining means is joined to the input means to establish a plurality of eigenrays with terms corresponding to at least one of the simulated sonar parameters. A lofargram means is joined to the defining means for interpolating said eigenrays to produce simulated lofargram output signals. The invention can also incorporate a report means for generating a report from the simulated lofargram output signals.
DTIC
Multipath Transmission; Sonar; Patents

20000048632 Department of the Navy, Washington, DC USA
Method and Apparatus for Simulating a Multipath Sonar System
Weinberg, Henry, Inventor; Nov. 30, 1999; 39p; In English; Supersedes US-Patent-Appl-SN-08/891369, AD-D018757
Patent Info.: Filed 10 Jul. 1997; US-Patent-5,995,803; US-Patent-Appl-SN-08/891,369
Report No.(s): AD-D019632; No Copyright; Avail: US Patent and Trademark Office, Microfiche
An apparatus and method is provided for producing an output simulating a multipath sonar system. An input means produces signals corresponding to sonar system parameters. A generator means is jointed to the input means to generate a plurality of eigenray parameters in response to the input signals. A processing means combines the generated eigenray parameters from the generate means with sonar system parameters from the input means to produce output signals. A report means is provided for generating reports simulating the response of a multipath sonar system to the output signals from the processing means.
DTIC
Simulation; Multipath Transmission; Sound Transmission; Sound Waves; Wave Propagation; Sonar

20000051531 Cincinnati Univ., OH USA
Evaluation of the SNAPSHOT 3D Head-Related Transfer Functions Measurement System ***Interim Report, Sep.-Nov. 1998***
Brungart, Douglas S.; Nelson, W. T.; Bolia, Robert; Tannen, Robert; Nov. 1998; 24p; In English
Contract(s)/Grant(s): Proj-7184
Report No.(s): AD-A375508; AFRL-HE-WP-TR-1999-0188; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The SNAPSHOT MX is a system designed to collect individualized Head-Related Transfer Functions (HRTFS) quickly and efficiently in non-anechoic rooms. The system, which consists of a signal processing workstation, a speaker stand, and a pair of microphones that are inserted into the ears of the subject, uses Golay codes to measure the time-domain impulse response of the transfer function from the speaker to the in-ear microphones. The impulse responses are then windowed to eliminate the effects of room reverberation and stored in an acoustic head map (AHM) file for rendering with the Convolvotron virtual audio display. This report outlines the SNAPSHOT system and presents the results of a study comparing auditory localization performance with individualized HRTFs measured with the SNAPSHOT to generic HRThs measured with the SNAPSHOT on the Knowles Electronics Manikin for Acoustic Research (KEMAR) and to the genetic SDO transfer functions packaged with the Convolvotron. The results indicate that localization performance is significantly worse with the individualized SNAPSHOT HRThs than with the genetic SDO HRThs.
DTIC
Acoustic Measurement; Anechoic Chambers; Auditory Perception; Auditory Signals

20000052259 Cleveland Clinic Foundation, Cleveland, OH USA
Ultrasound Imaging Initiative ***Annual Report, 21 Dec. 1998-20 Dec. 1999***
Cornhill, J. F.; Jan. 2000; 77p; In English
Contract(s)/Grant(s): DAMD17-99-1-9034
Report No.(s): AD-A375332; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This objective of this project is to build a real-time 3-D ultrasound imaging system for combat casualty care. The high frame rate necessary for real-time 3-D imaging is obtained using a synthetic aperture beamforming technique. The technique uses a fraction of the transmit pulses required by a conventional imaging system and permits very rapid image acquisition with no degradation of image quality. A network of high speed digital signal processors is currently being designed to implement the beamformer. A new transducer technology is also being explored for the transducer array. This technology should permit a 25-fold increase in the acoustic power delivered by a single array element without a corresponding increase in the excitation voltage. The array will be incorporated into a compact probe head designed to rock the array for real-time 3-D imaging. Besides the scanner development, an extensive set of software tools are being developed to provide easy and accurate analysis of the resulting 3-D data. These

tools will allow real-time viewing of arbitrary two-dimensional planes through the data set and will allow quantitative assessment and display of the three-dimensional anatomy.
DTIC
Real Time Operation; Imaging Techniques; Computer Programs; Three Dimensional Models

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ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see 73 Nuclear Physics.

20000044884 Rutherford Appleton Lab., Chilton, UK
Disordered Materials
ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 10-11; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

The Disordered Materials Group exists to support neutron scattering research into the structure and dynamics of liquids and disordered materials. The group operates the SANDALS diffractometer directly and is closely involved in the GEM development.
Author
Research and Development; Neutron Scattering; Liquids; Disorders

20000044888 Rutherford Appleton Lab., Chilton, UK
Muons
ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 20-21; In English; See also 20000044882; Original contains color illustration; Copyright; Avail: Issuing Activity

The Muon Group supports Condensed Matter and Chemical Physics communities through the operation of three muon beamlines, MuSR, EMU, and DEVA.
Author
Muons; Muon Spin Rotation; Particle Spin; Charged Particles; Condensed Matter Physics; Matter (Physics)

20000044900 Rutherford Appleton Lab., Chilton, UK
Dynamic Properties of the 2D S=1/2 Heisenberg Antiferromagnet Copper Formate Tetra-Deuterate
Ronnow, H. M., Edinburgh Univ., UK; McMorrow, D. F., Edinburgh Univ., UK; Harrison, A., Edinburgh Univ., UK; Youngson, D. I. D., Rutherford Appleton Lab., UK; Coldea, R., Rutherford Appleton Lab., UK; Perring, T. G., Rutherford Appleton Lab., UK; Aeppli, G., NEC Research Inst., USA; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 52-53; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

The two-dimensional S=1/2 Heisenberg antiferromagnet is important both as a fundamental problem in quantum mechanics, and due to its intimate relationship to the high-T(sub c) super-conducting cuprates. to address the dynamic behaviour of this system, we have performed experiments on the compound copper formate tetra-deuterate (CFTD) using the HET spectrometer. The results, taken together with some recent measurements of the static critical behavior, provide a complete picture of the dynamic and critical behaviour of this 2D quantum magnet over a large range of temperatures.
Author
Dynamic Characteristics; Two Dimensional Models; Heisenberg Theory; Antiferromagnetism

20000044906 Rutherford Appleton Lab., Chilton, UK
Using Muons to Model Proton Conductors
Lord, J. S., Rutherford Appleton Lab., UK; Cottrell, S. P., Rutherford Appleton Lab., UK; Williams, W. G., Rutherford Appleton Lab., UK; ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 64-65; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

The positive muon behaves as a light isotope of the proton. It can be implanted into any material showing proton conduction, where its diffusion rate can be measured and compared with the bulk conductivity for protons. Muon measurements have the advantage that they correspond to situations where the equilibrium proton concentration is very low and they report on the dynam-

ics on a time scale which is intermediate between that of the two major proton probes, NMR and neutron scattering. We illustrate the value of the muon technique with results on lithium oxide.
Author
Muons; Protons; Conductors

20000047280 Defence Evaluation Research Agency, Radiation Protection Services, Gosport, UK
Radioactive Wastes in a Conventional Military Environment
Clark, S. M., Defence Evaluation Research Agency, UK; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 18-1 - 18-4; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Although other types of radioactive waste exist, it is intended to concentrate on wastes originating from the process of luminising military equipment as this constitutes the bulk of the waste. The talk outlines the way radioactive materials have been used for the purpose of luminising United Kingdom military equipment, from its first use during the First World War, through its expansion of use in the Second World War to the current situation. The way in which the radioactive materials have been used, and the type of radioactive material used, is explored as are the consequences of the luminising of military equipment.
Derived from text
Radioactive Materials; Radioactive Wastes; Waste Disposal; UK

20000048639 Osaka Univ., Faculty of Engineering, Osaka, Japan
First-Principles Molecular-Dynamics Simulations of Etching Process by OH Molecules
Goto, Hidekazu, Osaka Univ., Japan; Hirose, Kikuji, Kyoto Inst. of Tech., Japan; Mori, Yuzo, Osaka Univ., Japan; Sugiyama, Kazuhisa, Osaka Univ., Japan; Inagaki, Koji, Osaka Univ., Japan; Kobata, Itsuki, Osaka Univ., Japan; Toyota, Hiromichi, Ehime Univ., Japan; Technology Reports of the Osaka University; Apr. 15, 2000; ISSN 0030-6177; Volume 50, No. 2370, pp. 33-39; In English
Contract(s)/Grant(s): MOESC-08CE2004; Copyright; Avail: Issuing Activity

In order to reveal the mechanism of the electro-chemical etching process in ultrapure water, first- principles molecular dynamics-simulations of the hydrogen-terminated Si (001) surfaces and the metal surfaces (Cu (001), Fe (001) and Al (001)) interacting with OH molecules were carried out on the basis of density-functional theory. The optimized electronic structures and atomic configurations of the OH chemisorbed surfaces were calculated. It was confirmed that the interaction between two OH molecules and the hydrogen-terminated surface silicon atom on the step edge breaks the Si-Si back-bond and initiates the etching process. In the case of metal surfaces, the chemisorption of an OH molecule on the Co (001) surface initiates the dissociation of the Cu-Cu back-bond and the etching process of the surface atom. In the cases of Fe (001) and Al (001), back-bonds of the surface atoms were not dissociated. These simulated results for the metal surfaces are in good agreement with experimental results.
Author
Molecular Dynamics; Simulation; Etching; Hydrogen; Electronic Structure

20000048640 Osaka Univ., Faculty of Engineering, Osaka, Japan
First-Principles Molecular-Dynamics Simulations of Atomic Removal Process and Binding Energy Analysis in EEM (Elastic Emission Machining)
Yamauchi, Kazuto, Osaka Univ., Japan; Inagaki, Kouji, Osaka Univ., Japan; Sugimoto, Mitsuhiro, Osaka Univ., Japan; Yamamoto, Kouji, Sharp Corp., Japan; Sugiyama, Kazuhisa, Osaka Univ., Japan; Hirose, Kikuji, Osaka Univ., Japan; Mori, Yuzo, Osaka Univ., Japan; Technology Reports of the Osaka University; Apr. 15, 2000; ISSN 0030-6177; Volume 50, No. 2369, pp. 27-32; In English
Contract(s)/Grant(s): MOESSC-08CE2004; Copyright; Avail: Issuing Activity

Interactions between ultra-fine powder (SiO2 or ZrO2) and work surface (Si(001)) in Elastic Emission Machining(EEM) are investigated by employing first-principles molecular-dynamics simulation. Mono- atomic removal process and non-induction of defects are observed in the both cases of powder materials. Calculated results of binding energies and separation forces between ultra-fine powder and work surface qualitatively agree with the value estimated from the experiment.
Author
Atomic Physics; Research; Zirconium Oxides; Silicon Dioxide; Nuclear Binding Energy; Molecular Dynamics

20000050472 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Device SEE Susceptibility Update: 1996-1998

Coss, J. R., Jet Propulsion Lab., California Inst. of Tech., USA; Miyahira, T. F., Jet Propulsion Lab., California Inst. of Tech., USA; Swift, G. M., Jet Propulsion Lab., California Inst. of Tech., USA; [1998]; 21p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This eighth Compendium continues the previous work of Nichols, et al, on single event effects (SEE) first published in 1985. Because the compendium has grown so voluminous, this update only presents data not publised in previous compendia.
Author

Single Event Upsets; Semiconductor Devices; Yield Point

20000052468 NASA Goddard Space Flight Center, Greenbelt, MD USA

Vapor Transport Within the Thermal Diffusion Cloud Chamber

Ferguson, Frank T., Catholic Univ. of America, USA; Heist, Richard H., Rochester Univ., USA; Nuth, Joseph A., III, NASA Goddard Space Flight Center, USA; [2000]; 8p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A review of the equations used to determine the 1-D vapor transport in the thermal diffusion cloud chamber (TDCC) is presented. These equations closely follow those of the classical Stefan tube problem in which there is transport of a volatile species through a noncondensible, carrier gas. In both cases, the very plausible assumption is made that the background gas is stagnant. Unfortunately, this assumption results in a convective flux which is inconsistent with the momentum and continuity equations for both systems. The approximation permits derivation of an analytical solution for the concentration profile in the Stefan tube, but there is no computational advantage in the case of the TDCC. Furthermore, the degree of supersaturation is a sensitive function of the concentration profile in the TD CC and the stagnant background gas approximation can make a dramatic difference in the calculated supersaturation. In this work, the equations typically used with a TDCC are compared with very general transport equations describing the 1-D diffusion of the volatile species. Whereas no pressure dependence is predicted with the typical equations, a strong pressure dependence is present with the more general equations given in this work. The predicted behavior is consistent with observations in diffusion cloud experiments. It appears that the new equations may account for much of the pressure dependence noted in TDCC experiments, but a comparison between the new equations and previously obtained experimental data are needed for verification.
Author

Vapors; Thermal Diffusion; Cloud Chambers; Continuity Equation

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NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see 93 Space Radiation. For atomic and molecular physics see 72 Atomic and Molecular Physics. For elementary particle physics see 77 Physics of Elementary Particles and Fields. For nuclear astrophysics see 90 Astrophysics.

20000044907 Rutherford Appleton Lab., Chilton, UK

A Radio Frequency Quadrupole Pre-injector for ISIS

Letchford, A., Rutherford Appleton Lab., UK; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 66-67; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

The pre-injector is the first stage of the ISIS acceleration process. It raises the energy of the particle beam to 665 keV so that it can be fed into the drift tube linac (DTL) for acceleration up to 70 MeV. to improve the linac efficiency, it is planned to replace the existing pre-injector with a radio frequency quadrupole (RFQ), and the ISIS injector group is well advanced in its plans to achieve this.
Author

Radio Frequencies; Quadrupoles; Injectors; Research Facilities; Laboratories

20000047452 Department of Energy, Office of Energy Research, Washington, DC USA

Calculation of resonance self-shielding for U-235 from 0 to 2250 eV

Leal, L. C.; Larson, N. M.; Derrien, H.; Santos, G. R.; Dec. 31, 1998; 11p; In English; Physics of nuclear science and technology Report No.(s): DE98-007158; ORNL/CP-98822; No Copyright; Avail: Department of Energy Information Bridge

Over the years, the evaluated U-235 cross sections in the resolved energy range have been extensively revised. A major accomplishment was the first evaluation released to the ENDF/B-VI library. In that evaluation, the low energy range bound was

lowered to 10(sup -5) eV, and the upper limit raised to 2,250 eV. Several high-resolution measurements in conjunction with the Bayesian computer code SAMMY were used to perform the analysis of the U-235 resonance parameters. SAMMY uses the Reich-Moore formalism, which is adequate for representing neutron cross sections of fissile isotopes, and a generalized least-squares (Bayes) technique for determining the energy-dependence of the neutron cross sections. Recently a re-evaluation of the U-235 cross section in the resolved resonance region was completed. This evaluation has undergone integral tests in various laboratories throughout the USA and abroad. The evaluation has been accepted for inclusion in ENDF/B-VI release 5. The intent of this work is to present results of calculations of self-shielded fission rates carried out with these resonance parameters and to compare those fission rates with experimental data. Results of this comparison study provide an assessment of the resonance parameters with respect to the calculation of self-shielded group cross sections.
NTIS
Shielding; Resonance

20000047453 Department of Energy, Office of Environmental Restoration and Waste Management, Washington, DC USA
Fission, total and neutron capture cross section measurements at ORELA for U-233, Al-27 and natural chlorine
Guber, K. H.; Spencer, R. R.; Leal, L. C.; Larson, D. C.; Santos, G.; Dec. 31, 1998; 6p; In English; Physics of nuclear science and technology
Report No.(s): DE98-007157; ORNL/CP-98821; No Copyright; Avail: Department of Energy Information Bridge

The authors have made use of the Oak Ridge Electron Linear Accelerator (ORELA) to measure the fission cross section of U-233 in the neutron energy range of 0.36 eV to (approximately) 700 keV. This paper reports integral data and average cross sections. In addition they measured the total neutron cross section of Al-27 and natural chlorine, as well as the capture cross section of Al over an energy range from 100 eV up to about 400 keV.
NTIS
Fission; Neutron Cross Sections; Absorption Cross Sections; Capture Effect

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OPTICS

Includes light phenomena and the theory of optical devices. For lasers see 36 Lasers and Masers.

20000045691 NASA Pasadena Office, CA USA
Optical-to-Tactile Translator
Langevin, Maurice L., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Moynihan, Philip I., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Apr. 25, 2000; 10p; In English
Patent Info.: Filed 7 Aug. 1998; NASA-Case-NPO-20230-1; US-Patent-6,055,048; US-Patent-Appl-SN-137865; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An optical-to-tactile translator provides an aid for the visually impaired by translating a near-field scene to a tactile signal corresponding to said near-field scene. An optical sensor using a plurality of active pixel sensors (APS) converts the optical image within the near-field scene to a digital signal. The digital signal is then processed by a microprocessor and a simple shape signal is generated based on the digital signal. The shape signal is then communicated to a tactile transmitter where the shape signal is converted into a tactile signal using a series of contacts. The shape signal may be an outline of the significant shapes determined in the near-field scene, or the shape signal may comprise a simple symbolic representation of common items encountered repeatedly. The user is thus made aware of the unseen near-field scene, including potential obstacles and dangers, through a series of tactile contacts. In a preferred embodiment, a range determining device such as those commonly found on auto-focusing cameras is included to limit the distance that the optical sensor interprets the near-field scene.
Author
Optical Measuring Instruments; Digital Electronics; Transmitters; Near Fields; Images

20000045697 NASA Johnson Space Center, Houston, TX USA
Method and Apparatus for Improved Spatial Light Modulation
Soutar, Colin, Inventor, NASA Johnson Space Center, USA; Juday, Richard D., Inventor, NASA Johnson Space Center, USA; Apr. 25, 2000; 24p; In English; Division of US-Patent-Appl-SN-327762, filed 24 Oct. 1994
Patent Info.: Filed 27 Jul. 1998; NASA-Case-MSC-22378-2; US-Patent-6,055,086; US-Patent-Appl-SN-123016; US-Patent-Appl-SN-327762; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A method and apparatus for modulating a light beam in an optical processing system is described. Preferably, an electrically-controlled polarizer unit and/or an analyzer unit are utilized in combination with a spatial light modulator and a controller. Preferably, the spatial light modulator comprises a pixelated birefringent medium such as a liquid crystal video display. The combination of the electrically controlled polarizer unit and analyzer unit make it simple and fast to reconfigure the modulation described by the Jones matrix of the spatial light modulator. A particular optical processing objective is provided to the controller. The controller performs calculations and supplies control signals to the polarizer unit, the analyzer unit, and the spatial light modulator in order to obtain the optical processing objective.
Author
Technology Assessment; Light Modulation; Light Beams; Optical Equipment; Light Modulators

20000048283 Coast Guard, Research and Development Center, Groton, CT USA
Evaluation of Night Vision Goggles (NVG) for Maritime Search and Rescue: HH-65A Sweep Width Verification and Laser Illuminator Evaluation - Final Field Test Results ***Final Report***
Gross, K.; Wallace, H.; Larson, D.; McClay, T.; Jan. 2000; 146p; In English
Contract(s)/Grant(s): DTCG39-94-D-E56616
Report No.(s): AD-A376017; USCG-D-07-00; R&DC-231-99; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy
The US Coast Guard R&D Center conducted field tests to evaluate the search effectiveness of Coast Guard HH-65A helicopters equipped with night vision goggles (NVG). The purpose of the tests was to determine if the HH-65A's NVG search performance differed significantly from that of the Coast Guard HH-60J, and to assist the Coast Guard in deciding whether to continue to experiment with a near-infrared (IR), wide-area illuminator as an alternative to the aircraft's landing/hover lights. Helicopters searched test ranges for small boats, life rafts, and mannequins. Analysts collected aircraft and target positions, target detection logs, and environmental and human factors data. Following reconstruction and analysis, sweep width data from the two aircraft were compared. No statistically significant differences in NVG search performance were found between the two aircraft. HH-65A data were combined with existing HH-60J data to produce updated sweep width tables incorporating additional illumination, environmental, and human factors conditions. Active illumination improved sweep width under all conditions tested. Low-intensity, near-IR illumination provided a small sweep width improvement over landing lights when whitecaps were present.
DTIC
Goggles; Human Factors Engineering

20000048409 NASA Goddard Space Flight Center, Greenbelt, MD USA
Earth Scanner Bearing Accelerated Life Test
Dietz, Brian J., Schaeffer Magnetics, Inc., USA; VanDyk, Steven G., Raytheon Systems Co., USA; Predmore, Roamer E., NASA Goddard Space Flight Center, USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 303-316; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche
The Moderate Resolution Imaging Spectrometer (MODIS) optical instrument for NASA Goddard will measure biological and physical processes on the Earth's surface and in the lower atmosphere. A key component of the instrument is an extremely accurate scan mirror motor/encoder assembly. of prime concern in the performance and reliability of the scan motor/encoder is bearing selection and lubrication. This paper describes life testing of the bearings and lubrication selected for the program.
Author
Scanners; Bearings; Accelerated Life Tests; Service Life

20000048820 Michigan Univ., Dept. of Electrical Engineering and Computer Science, Ann Arbor, MI USA
Quantum Optical Studies of Semiconductors ***Final Report, 15 Feb. 1996 - 14 Jun. 1999***
Steel, Duncan G.; Aug. 31, 1999; 13p; In English
Contract(s)/Grant(s): F49620-96-1-0062
Report No.(s): AD-A375830; UM/EECS-96-0125; AFRL-SR-BL-TR-00-0090; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Work on this program focused on the development and application of advanced optical spectroscopy and methodology for the study of the quantum optical properties of semiconductor heterostructures. The work includes the first observation of the nonlinear optical polariton reflecting the complex nature of exciton-exciton interactions as well as the first observation of the light-hole-heavy-hole exciton Raman coherence. The program then moved toward the study of quantum dots, and reported the first observation of the coherent nonlinear optical response from a single quantum dot exciton as well as the first demonstration of the coherent optical control and exciton wave function engineering in a single quantum dot. The work also provides the first demonstration of optically induced Zeeman coherence and two-electron entanglement in a single dot. Finally, we developed a nonlinear

optical near field scanning microscope for directly probing nano-optical structures. The first data from this system is remarkable and provides a mapping of the center-of-mass of the wave function of a localized exciton.
DTIC
Quantum Optics; Optical Properties

20000050274 Department of the Navy, Washington, DC USA
Method for Irradiating Patterns in Optical Waveguides Containing Radiation Sensitive Constituents
Patton, Scott L., Inventor; Nov. 16, 1999; 9p; In English; Supersedes US-Patent-Appl-SN-08/709624, AD-D018206
Patent Info.: Filed 9 Sep. 1996; US-Patent-5,985,523; US-Patent-Appl-SN-08/709,624
Report No.(s): AD-D019637; No Copyright; Avail: US Patent and Trademark Office, Microfiche

This patent discloses a method and apparatus for establishing predetermined patterns in a selected region of an optical waveguide. A positioning device holds the wave guide proximate a radiation source. The radiation source defines a radiation pattern corresponding to the desired patterns. The resulting radiation patterns induce a loss in the light transmission capability in a portion of the waveguide that contains a radiation sensitive constituent and that the radiation penetrates. Thereafter the optical waveguide ages to reach an equilibrium state. Thereafter, the irradiated areas form the predetermined patterns in the optical waveguide. The patterns may take the from of Bragg gratings in the waveguide.
DTIC
Patents; Optical Waveguides; Pattern Recognition; Image Analysis; Image Processing; Light Transmission

20000050275 Department of the Navy, Washington, DC USA
Adaptive Polarization Diversity Detection Scheme for Coherent Communications and Interferometric Fiber Sensors
Kersey, Alan D., Inventor; Marrone, Michael J., Inventor; Dandridge, Anthony, Inventor; Nov. 16, 1999; 13p; In English; Supersedes US-Patent-Appl-SN-08/354931
Patent Info.: Filed 12 Dec. 1994; US-Patent-5,986,784; US-Patent-Appl-SN-08/354,931
Report No.(s): AD-D019636; No Copyright; Avail: US Patent and Trademark Office, Microfiche

A method and apparatus for overcoming polarization induced signal fading in both heterodyne communication and interferometric sensing. An adjustable birefringent element in series with a linear-polarization beam splitter forms an elliptical-polarization beam splitter. The birefringent element controllably evolves the states of polarization of two input signals thereby controlling the power contribution of each signal onto the orthogonal axes used by the linear beam splitter. When the states of polarization are evolved such that there are equal signal to reference power ratios on the beam splitter axes, subsequent detectors generate a constant, optimum amplitude signal without the need for weighting or decision circuits.
DTIC
Coherent Radiation; Optical Communication; Signal Fading; Signal Processing; Heterodyning; Interferometry

20000051478 Ralcon Development Lab., Paradise, UT USA
Large Aperture Multiplexed Diffractive Lidar Optics *Final Report*
Rallison, Richard D., Ralcon Development Lab., USA; May 10, 1999; 24p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS5-98062
Report No.(s): Rept-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have delivered only 2 or 3 UV Holographic Optical Elements (HOEs) thus far and have fallen short of the intended goal in size and in dual wavelength function. Looking back, it has been fortuitous that we even made anything work in the UV region. It was our good fortune to discover that the material we work with daily was adequate for use at 355 nm, if well rinsed during processing. If we had stuck to our original plan of etching in small pieces of fused silica, we would still be trying to make the first small section in our ion mill, which is not yet operational. The original plan was far too ambitious and would take another 2 years to complete beginning where we left off this time. In order to make a HOE for the IR as well as the UV we will likely have to learn to sensitize some film to the 1064 line and we have obtained sensitizer that is reported to work in that region already. That work would also take an additional year to complete.
Author
Apertures; Diffractive Optics; Optical Radar; Holographic Optical Elements

20000052260 Oregon State Univ., Coll. of Oceanic and Atmospheric Sciences, Corvallis, OR USA
Coastal Optics and Mixing ***Final Report***
Pegau, W. S.; Zaneveld, J. R.; Mar. 29, 2000; 7p; In English
Contract(s)/Grant(s): N00014-98-1-0414
Report No.(s): AD-A375331; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The long-term goal of this study is to relate optical and fluid dynamic processes on vertical scales of centimeters to tens of meters. The objectives of this study are to address the following questions: 1.)Under what circumstances do the physical forcing mechanisms determine the optical properties and hence radiative transfer? 2.)Does mixing affect the dissolved and particulate components differently? 3.)Can the distribution of dissolved and particulate optical substances be used as tracers of physical processes? 4.)How does the size of the particles in the bottom boundary layer affect the spectral slope of the beam attenuation coefficient?
DTIC
Optical Properties; Coasts

20000052495 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Quantum Interferometry
Dowling, Jonathan P., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 1p; In English; Copyright; Avail: Issuing Activity; Abstract Only

Recently, several researchers, including yours truly, have been able to demonstrate theoretically that quantum photon entanglement has the potential to also revolutionize the entire field of optical interferometry, by providing many orders of magnitude improvement in interferometer sensitivity. The quantum entangled photon interferometer approach is very general and applies to many types of interferometers. In particular, without nonlocal entanglement, a generic classical interferometer has a statistical-sampling shot-noise limited sensitivity that scales like 1/Sqrt[N], where N is the number of particles (photons, electrons, atoms, neutrons) passing through the interferometer per unit time. However, if carefully prepared quantum correlations are engineered between the particles, then the interferometer sensitivity improves by a factor of Sqrt[N] (square root of N) to scale like 1/N, which is the limit imposed by the Heisenberg Uncertainty Principle. For optical (laser) interferometers operating at milliwatts of optical power, this quantum sensitivity boost corresponds to an eight-order-of-magnitude improvement of signal to noise. Applications are to tests of General Relativity such as ground and orbiting optical interferometers for gravity wave detection, Laser Interferometer Gravity Observatory (LIGO) and the European Laser Interferometer Space Antenna (LISA), respectively.
Author
Interferometers; Optical Measurement; Optical Equipment; Laser Interferometry

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

20000045721 Association Euratom-CEA, Dept. de Recherches sur la Fusion Controlee, Saint Paul-les-Durance, France
Diagnostics of MCF plasmas using Lyman-(alpha) fluorescence excited by one or two photons
Voslamber, D.; Nov. 30, 1998; 84p; In English
Report No.(s): DE99-627808; EUR-CEA-FC-1650; No Copyright; Avail: Department of Energy Information Bridge

Laser-induced Lyman-(alpha) fluorescence of the hydrogen isotopes is investigated with regard to diagnostic applications in magnetically confined fusion plasmas. A formal analysis is presented for two excitation schemes: one-photon and Doppler-free two-photon excitation. The analysis includes estimates of the expected experimental errors arising from the photon noise and from the sensitivity of the observed fluorescence signals to variations of the plasma and laser parameters. Both excitation schemes are suitable primarily for application in the plasma edge, but even in the plasma bulk of large machines they can still be applied in combination with a diagnostic neutral beam. The two-photon excitation scheme is particularly attractive because it involves absorption spectra that are resolved within the Doppler width. This implies a large diagnostic potential and in particular offers a way to measure the deuterium-tritium fuel mix in fusion reactors.
NTIS
Fluorescence; Photons; Plasmas (Physics); Plasma Physics

20000045722 Association Euratom-CEA, Dept. de Recherches sur la Fusion Controlee, Saint Paul-les-Durance, France
One-D full-wave description of plasma emission and absorption in the ion cyclotron range of frequency in tokamaks
Fraboulet, D.; Becoulet, A.; Nguyen, F.; Nov. 30, 1998; 45p; In English
Report No.(s): DE99-627807; EUR-CEA-FC-1646; No Copyright; Avail: Department of Energy Information Bridge

To maintain the ignition state in a tokamak fusion reactor, a control must be performed on the population of alpha-products, and this implies the ability to diagnose those (alpha)-particles. It is studied here whether the detection of emission radiated in the ion cyclotron range of frequency be a reactor plasma can provide useful information concerning fusion products, especially concerning their density profile. It is shown that the detection of the radiation emitted by the fast alpha particles along their cyclotron motion can give access to moments of their distribution function. This requires to compute the phase of the emitted field, using a full-wave approach. Such a technique allows to set in a convenient way the inverse problem of the determination of the emitting (alpha)-particles distribution through the radiation detection. A brief analysis of the expected situation in a reactor-relevant plasma is given. In parallel, the 1-D full-wave code developed in this frame is also useful for studying the physics of Fast Wave plasma heating. It enables to take into account the mode conversion of the Fast Wave into the Ion Bernstein Wave that appears near each ion cyclotron resonance. Results show that higher order terms may significantly alter the energy partitioning, in hot plasma cases involving mode conversion heating and/or ion cyclotron high harmonics heating.
NTIS
Ion Cyclotron Radiation; Emission Spectra; Cyclotron Frequency; Plasma Radiation; Plasma Waves; Plasma Physics

20000045723 Association Euratom-CEA, Dept. de Recherches sur la Fusion Controlee, Saint Paul-les-Durance, France
Inertial confinement fusion with magnetized fuel in cylindrical targets
Basko, M.; Nov. 30, 1998; 23p; In English
Report No.(s): DE99-627806; EUR-CEA-FC-1645; No Copyright; Avail: Department of Energy Information Bridge

Basic physical principles underlying the performance of cylindrical targets within the concept of magnetized target fusion (MTF) are discussed. If confirmed feasible, such targets might offer an alternative way to a thermonuclear ignition facility for a heavy ion driver. It is shown that inherent inefficiency of cylindrical implosions can be offset by introduction of initial magnetic field of B(sub 0) (approx) (1-3) x 10(exp 5) G. by inhibiting thermal heat conduction, the magnetic field can lower the fuel (pr) threshold for ignition by about a factor 10. An external fuel preheat of up to 100 eV may be needed. A possible target scheme for high gain in cylindrical geometry is outlined.
NTIS
Inertial Confinement Fusion; Plasma Physics

20000045725 Association Euratom-CEA, Dept. de Recherches sur la Fusion Controlee, Saint Paul-les-Durance, France
Soc dynamics in a 2D model of turbulent particle transport in the sol
Ghendrih, P.; Sarazin, Y.; Dec. 31, 1998; 42p; In English
Report No.(s): DE99-627804; EUR-CEA-FC-1636; No Copyright; Avail: Department of Energy Information Bridge

Interchange turbulence in two-dimensions is investigated in the Scrape-Off Layer of fusion devices, when driven by a constant core particle influx. Contrary to the standard gradient driven approach, density is allowed to fluctuate around its average profile. Transverse transport exhibits some of the features of Self-organized Critical systems, namely, inward and outward avalanches, together with a frequency spectrum decrease in 1 / f and f(sup -2) at intermediate and high frequencies respectively. An avalanches occurs when follows the large radial structures of the electric potential. As experimentally, the radial profile of density relative fluctuations decreases from the wall into the core plasma, while that of density relative fluctuations peaks inside the SOL. Equilibrium density exhibits the experimental exponential decrease. An analytical expression of the SOL width (Delta)(sub SOL) is obtained, which maximizes the linear growth rate, when the poloidal modulation of electric potential equilibrium is taken into account. The parametric dependence of (Delta)(sub SOL) well agrees with experimental data.
NTIS
Plasma Physics; Plasma Turbulence

20000045726 Association Euratom-CEA, Dept. de Recherches sur la Fusion Controlee, Saint Paul-les-Durance, France
Boundary conditions for collisional sheath
Chen, X. P.; Dec. 31, 1998; 11p; In English
Report No.(s): DE99-627803; EUR-CEA-FC-1635; No Copyright; Avail: Department of Energy Information Bridge

Collisional sheath problem is studied by using a two-fluid model. Reasonable boundary conditions and space charge at the sheath edge are found based on the analysis of the Sagdeev potential. A full numerical calculation both in presheath and sheath regions are also carried out in these bases.
NTIS
Boundary Conditions; Plasma Sheaths; Collisional Plasmas; Plasma Physics

20000045727 Association Euratom-CEA, Dept. de Recherches sur la Fusion Controlee, Saint Paul-les-Durance, France
Separatrix crossing and large scale diffusion in low-frequency three-wave systems
Reuss, J. D.; Misguich, J.; Weyssow, B.; Dec. 31, 1998; 11p; In English
Report No.(s): DE99-627802; EUR-CEA-FC-1634; No Copyright; Avail: Department of Energy Information Bridge
The E x B guiding centre diffusion in three low-frequency 2D electrostatic waves is considered. It is shown that the stochastic GC diffusion can be explained and predicted with the help of the rules of the adiabatic theory of Hamiltonian systems i.e.: conservation of the canonical action except at separatrix crossing times; time evolution of the canonical action determined by the surfaces enclosed by the separatrices of the potential.. The probability distributions are calculated. Our demonstration applies at least for isotropically distributed wave vectors, very high Kubo number K and closed equipotentials. A statistical analysis of the dynamics shows that the GC motion is a spaced constrained random walk governed by a 'complete trapping' scaling law for diffusion: D-bar(K) = K(sup 0). This result is demonstrated both semi- analytically and numerically.
NTIS
Diffusion; Electrostatic Waves; Plasma Physics

20000048275 Old Dominion Univ., Dept. of Applied Science, Norfolk, VA USA
Theoretical Studies on Microwave Plasma Electronics and Microhollow Cathode Discharges ***Final Report, 1 Jan. 1998 - 31 Dec. 1999***
Shenggang, Liu; Schoenback, Karl H.; Jan. 2000; 302p; In English
Contract(s)/Grant(s): F49620-98-1-0065
Report No.(s): AD-A375944; AFRL-SR-BL-TR-00-0095; No Copyright; Avail: CASI; A03, Microfiche; A14, Hardcopy
The final report summarizes in its first part the most recent scientific achievements. They are documented in the listed and enclosed copies of publications and drafts of papers. In the second part the recent academic activities are reported, and the third part gives and outlook of planned activities based on the work supported by this grant.
DTIC
Hollow Cathodes; Plasma Physics; Plasmas (Physics); Cathodes

20000048643 Osaka Univ., Faculty of Engineering, Osaka, Japan
Heating of Field-Reversed Configuration Plasma by Applying Fast Rising Magnetic Pulse
Yoshimura, Satoru, Osaka Univ., Japan; Yamanaka, Koji, Osaka Univ., Japan; Matsumoto, Takuya, Osaka Univ., Japan; Okada, Shigefumi, Osaka Univ., Japan; Goto, Seiichi, Osaka Univ., Japan; Technology Reports of the Osaka University; Apr. 15, 2000; ISSN 0030-6177; Volume 50, No. 2366, pp. 1-9; In English; Copyright; Avail: Issuing Activity
A fast rising magnetic pulse is applied to a translated FRC plasma. The stored energy of the FRC plasma increases clearly, showing that the plasma is heated. Furthermore, the lifetime of the plasma becomes longer. A large amplitude oscillation is observed on an internal magnetic probe signal which is oriented with the axis in the azimuthal direction. The phase velocity of the oscillation in a direction parallel to the equilibrium magnetic field is consistent with the estimated Alfv6n velocity. The experimental results suggest that the shear Alfven wave is excited by the magnetic pulse. The excited shear Alfven wave seems to play an important role in the heating of the plasma.
Author
Magnetic Field Configurations; Magnetic Fields; Magnetic Probes; Phase Velocity; Plasma Heating

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SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

20000044883 Rutherford Appleton Lab., Chilton, UK
Crystallography
ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 8-9; In English; See also 20000044882; Copyright; Avail: Issuing Activity

The crystallography program at ISIS is largely carried out on the diffractometers POLARIS, HRPD, SXD and HiPr (PEARL), with significant crystallography components also found on OSIRIS and ROTAX. These offer high flux and high resolution powder diffraction, single crystal diffraction and reciprocal space surveying, advanced high pressure diffraction and long wavelength diffraction. The GEM diffractometer is now being installed and its commissioning phase is due to commence in the Autumn of 1999. The suite of instruments is in high demand, with applications straddling the areas of chemistry, materials science and physics. There is also an expanding Earth Sciences program, among the highlights of which have been continuing studies of the complex amphibole structures and a detailed study of the cation ordering phase transition in ilmenite-hematite solid solutions.
Author
Crystallography; Diffractometers; High Pressure; High Resolution; Diffraction; Diffraction Patterns

20000044890 Rutherford Appleton Lab., Chilton, UK
Solid-state Structures of Covalent Hydrides
Maley, I. J., Edinburgh Univ., UK; Parsons, S., Edinburgh Univ., UK; Pulham, C. R., Edinburgh Univ., UK; Ibberson, R. M., Rutherford Appleton Lab., UK; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 30-31; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Understanding the structure of matter is an area of fundamental importance that bridges chemistry, physics, materials and the biological sciences. The significance of secondary bonding interactions and their effect on the properties of solids is becoming increasingly recognized. The study of very simple molecules in the solid state can provide an insight into these secondary interactions and gives valuable experimental data for testing theoretical methods aimed at predicting solid state structures. High resolution powder neutron diffraction is a powerful tool for studying simple molecules and intermolecular interactions in the solid state, as examples from HRPD show.
Author
High Resolution; Powder (Particles); Neutron Diffraction; Crystallography; Molecular Interactions; Intermolecular Forces; Molecular Structure

20000044902 Rutherford Appleton Lab., Chilton, UK
An Ordered Stack of Spin Valves in a Layered Magnetoresistive Perovskite
Perring, T. G., Rutherford Appleton Lab., UK; Aeppli, G., NEC Research Inst., USA; Kimura, T., JRCAT, Japan; Adams, M. A., Rutherford Appleton Lab., UK; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 56-57; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

In the past few years there has been a huge revival of interest in manganese oxides with cubic perovskite structure, RE(1-x)A(x)MnO3 (RE = La, Pr, Nd and A = Ca, Ba, SR, Pb), because of the very large magnetic field-induced changes in electrical resistance they can display. This phenomenon is known as colossal magneto-resistance (CMR). The magnetic fields are typically several Tesla, however, which limits applications in technologies such as magnetic memory and sensors. One approach for production of low-field magnetoresistance is to make ceramics with crystal structures that consist of multilayers of ferromagnetic manganite sheets separated by insulating material. This approach has recently succeeded with La(2-2x)SR(1+2x)Mn2O7 for x=0.3. to determine the mechanism for this low temperature magnetoresistance magnetic neutron diffraction has been performed on single crystal samples using the IRIS and OSIRIS spectrometers.
Author
Magnetoresistivity; Magnetic Fields; Perovskites; Manganese Oxides

20000044905 Rutherford Appleton Lab., Chilton, UK

Vortex Lattice Stability in Organic Superconductors Studied with Muons

Blundell, S. J., Oxford Univ., UK; Pratt, F. L., Institute of Physical and Chemical Research, Japan; Lee, S. L., Saint Andrew's Univ., UK; ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 62-63; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Layered organic superconductors based on the molecule ET (bis(ethylenedithio)-tetrathiafulvalene, also known as BEDT-TTF) share a distinctive property of many cuprate superconductors, namely that they are extremely anisotropic. This leads to highly unconventional behavior in the B-T phase-diagram. Exceptional quality single crystals of these materials can be prepared which show Shubnikov-de Haas oscillations in high magnetic fields, allowing detailed measurements of the shape of their Fermi surfaces. Thus ET superconductors are excellent model systems to test theories of pairing and also vortex dynamics. Muon-spin rotation measurements at ISIS have allowed the stability of the vortex lattice in various ET superconductors to be studied in detail. Author

Vortices; Vortex Lattice Method; Stability; Organic Superconductors; Muons

20000046568 National Renewable Energy Lab., Golden, CO USA

Induced Recrystallization of CdTe Thin Films Deposited by Close-Spaced Sublimation

B. Mayo,; Oct. 29, 1998; 9p; In English; American Vacuum Society National Meeting, 2-6 Nov. 1998, Baltimore, MD, USA

Report No.(s): DE00-009543; NREL/CP-520-25782; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We have deposited CdTe thin films by close-spaced sublimation at two different temperature ranges. The films deposited at the lower temperature partially recrystallized after CdCl2 treatment at 350C and completely recrystallized after the same treatment at 400 C. The films deposited at higher temperature did not recrystallize at these two temperatures. These results confirmed that the mechanisms responsible for changes in physical properties of CdTe films treated with CdCl2 are recrystallization and grain growth, and provided an alternative method to deposit CSS films using lower temperatures.

NTIS

Cadmium Tellurides; Recrystallization; Thin Films

20000046569 National Renewable Energy Lab., Golden, CO USA

Elements of Doping Engineering in Semiconductors

A. Zunger,; S. Wei,; S.B. Zhang,; Nov. 09, 1998; 10p; In English; National Center for Photovoltaics Program Review Meeting, 8-11 Sep. 1998, Denver, CO, USA

Report No.(s): DE00-009542; NREL/CP-590-25746; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Using defect thermodynamics, we discuss physical factors that affect doping limits in semiconductors. The dependencies of the defect formation enthalpy on the atomic chemical potentials and on the electron Fermi energy are demonstrated. These dependencies, in particular on the Fermi energy, lead to spontaneous formation of charge-compensating defects that can limit doping. Experimental data compiled for III-V, II-VI, and I-III-VI2 compounds support this view and further provide insight into the connections among different host materials. We argue that what matters is not the magnitude of the band gap that determines the dopability of a material, but rather, the relative position of the conduction-band minimum (in the case of n-doping) and the valence-band maximum (in the case of p-doping) with respect to vacuum.

NTIS

Crystal Defects; Physical Factors; Semiconductors (Materials); Additives

20000048378 Moscow State Univ., Nauchno-Issledovatel'skij Inst., Russia

Abstracts of the reports from the 29. International conference on physical aspects of charge particle interactions with crystals

Tulinov, A. F.; Dec. 31, 1999; 27p; In Russian; In English; 29th, Russia

Report No.(s): DE99-638990; INIS-RU-434; No Copyright; Avail: National Technical Information Service (NTIS); Abstracts Only

Investigation results on the interaction of electrons, positrons, light and heavy ions with matter as well as associated effects are reported. Charged particle scattering, surface sputtering, radiation-induced changes in structure and properties are discussed. A consideration is also given to radiation methods of studying electronic and crystalline structures

NTIS

Conferences; Charged Particles; Particle Interactions

20000048638 Osaka Univ., Faculty of Engineering, Osaka, Japan

STM/STS Observations and First-Principles Simulations of Metal Adsorbed Si (001) Surfaces

Endo, Katsuyoshi, Osaka Univ., Japan; Arima, Kenta, Osaka Univ., Japan; Kataoka, Toshihiko, Osaka Univ., Japan; Oshikane, Yasushi, Osaka Univ., Japan; Inoue, Haruyuki, Osaka Univ., Japan; Koba, Kenji, Osaka Univ., Japan; Hirose, Kikuji, Osaka Univ., Japan; Mori, Yuzo, Osaka Univ., Japan; Technology Reports of the Osaka University; Apr. 15, 2000; ISSN 0030-6177; Volume 50, No. 2371, pp. 41-47; In English

Contract(s)/Grant(s): MOESSC-08CE2004; Copyright; Avail: Issuing Activity

It is essential for ultra large-scale integrated (ULSI) devices in the next generation to identify metallic contaminations with high sensitivity on the Si surface. In this article, we show the local density of states (LDOS) on the Al/Si (001) 2 x 1 and Cu/Si (001) 2 x 1 surfaces measured by scanning tunneling microscopy (STM)/spectroscopy (STS) at room temperature. It is confirmed that the LDOS on an Al adsorbed site is different from that on a Cu adsorbed site. The measured LDOS on an Al dimer is compared with the simulated one that is based on the first-principles of quantum mechanics, and the possibility of a micro elementary analysis is discussed.

Author

Scanning Tunneling Microscopy; Spectroscopy; Metal Surfaces; Contamination; Density (Mass/Volume); Silicon Films

20000048642 Osaka Univ., Faculty of Engineering, Osaka, Japan

Transmission Electron Microscopic Study of the Interface Structure of Diamond Particles Grown on Pt(111) Substrate by Bias-Enhanced Nucleation Chemical Vapor Deposition Process

Zhou, Guofu, Osaka Univ., Japan; Takai, Yoshizo, Osaka Univ., Japan; Shimizu, Ryuichi, Osaka Univ., Japan; Technology Reports of the Osaka University; Apr. 15, 2000; ISSN 0030-6177; Volume 50, No. 2367, pp. 11-17; In English; Copyright; Avail: Issuing Activity

The interface structure of isolated diamond particles grown on Pt(lll) substrate by the bias-enhanced nucleation (BEN) chemical vapor deposition (CVD) process was studied by cross-sectional transmission electron microscopy. The study shows that the interface was very rough and there was a large amount of graphite existing in concavities on the Pt substrate. A large number of Pt fragments were scattered near the interface. The Pt fragments possibly disturb the heteroepitaxial diamond growth on the Pt substrate and induce the occurrence of multiply-twinned diamond particles in the bias-enhanced nucleation CVD process.

Author

Diamonds; Platinum; Interfaces; Transmission Electron Microscopy; Fragments; Crystal Growth; Research

20000048644 University of Electro-Communications, Tokyo, Japan

Fabrication of MIS Type Tunnel Emitter Using Thin Si Oxide Film by Plasma Oxidation

Usami, Kouichi, University of Electro-Communications, Japan; Miyake, Eitaro, University of Electro-Communications, Japan; Moriya, Masataka, University of Electro-Communications, Japan; Kobayashi, Tadayuki, University of Electro-Communications, Japan; Goto, Toshinari, University of Electro-Communications, Japan; Bulletin of the University of Electro-Communications; December 1999; ISSN 0915-0935; Volume 12, No. 2, pp. 135-139; In English; Copyright; Avail: Issuing Activity

Thin Si oxide films with the thickness of less than 15 nm for the application to the barrier insulator of tunnel emitter were grown on the n-type Si(100) substrates using hollow discharge enhanced DC plasma oxidation. The film thickness and the film quality were examined by the elipsometry and the XPS energy spectrum of Si 2p core level, respectively. Au metal electrodes were deposited on the oxide film to form a MIS diode type tunnel emitter. The electrical properties of the diodes, such as I-V characteristics and junction resistance were measured for various oxidation conditions. The electron emission current into the vacuum from a tunnel emitter having 0.2 sq mm emission area was also measured. The measured value of the current density for a typical sample was of the order of 6.0 nA/sq mm at the diode voltage of 11V.

Author

Fabrication; Diodes; Electrical Properties; Film Thickness; Insulators; Oxide Films; Substrates

20000052246 Risoe National Lab., Condensed Matter Physics and Chemistry Dept., Roskilde, Denmark

Condensed Matter Physics and Chemistry Department 1 January - 31 December 1998 ***Progress Report***

Bechgaard, K.; Clausen, K. N.; Feidenhans'l, R.; Johannsen, I.; Apr. 30, 1999; 186p; In English

Report No.(s): DE99-627849; RISO-R-1099(EN); ISBN 87-550-2508-0; No Copyright; Avail: Department of Energy Information Bridge

The Condensed Matter Physics and Chemistry Department is concerned with both fundamental and applied research into the physical properties of materials. The principal activities in the year 1998 are presented in this progress report. The research in physics is concentrated on neutron and x-ray scattering measurements and the problems studied include two- and three-dimen-

sional structures, magnetic ordering and spin dynamics, superconductivity, phase transitions and nano-scale structures. The research in chemistry includes chemical synthesis and physico-chemical investigation of small molecules and polymers, with emphasis on polymers with new optical properties, block copolymers, surface-modified polymers, and supramolecular structures. Theoretical work related to these problems is undertaken, including Monte Carlo simulations, computer simulation of molecules and polymers and methods of data analysis.
NTIS
Condensed Matter Physics; Physical Chemistry

20000052502 Case Western Reserve Univ., Cleveland, OH USA
Determination of the Peltier Coefficient of Germanium in a Vertical Bridgeman-Stockbarger Furnace
Weigel, Michaela E. K., Case Western Reserve Univ., USA; Matthiesen, David H., Case Western Reserve Univ., USA; Journal of Crystal Growth; 1997; ISSN 0022-0248; Volume 174, pp. 194-201; In English
Contract(s)/Grant(s): NAS8-39722; Copyright; Avail: Issuing Activity

The Peltier effect is the fundamental mechanism that makes interface demarcation through current pulsing possible. If a method for calculating the necessary current density for effective demarcation is to be developed, it will be necessary to know the value of the Peltier coefficient. This study determined experimentally the value of the Peltier coefficient for gallium-doped germanium by comparing the change in average growth rates between current-on and current-off periods. Current-on and current-off layer thickness measurements were made using differential interference contrast microscopy and atomic force microscopy. It was found that the Joule and Thomson effects could not be neglected. Peltier coefficients calculated from the experimental data with an analysis that accounts for Joule, Thomson, and Peltier effects yielded an average value for the Peltier coefficient of 0.076 +/- 0.015 V.
Author
Peltier Effects; Semiconductors (Materials); Germanium; Atomic Force Microscopy

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PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 Atomic and Molecular Physics, 73 Nuclear Physics, and 25 Inorganic, Organic and Physical Chemistry.

20000048646 University of Electro-Communications, Tokyo, Japan
Non-Linear Continuous Maps on Abstract Wiener Spaces Defined on Space of Tempered Distributions
Yoshida, Minoru W., University of Electro-Communications, Japan; Bulletin of The University of Electro-Communications; December 1999; ISSN 0915-0935; Volume 12, No. 24, pp. 101-117; In English
Contract(s)/Grant(s): MOE-09304022; MOE-09440074; MOE-09640163; Copyright; Avail: Issuing Activity

Wiener spaces on Banach spaces which are subspaces of tempered distributions on R(sup d) are constructed by making use of multiple stochastic integrals. The free Euclidean field is an example of the abstract Wiener spaces constructed here. On the abstract Wiener spaces non-linear continuous maps are defined.
Author
Nonlinearity; Maps; Banach Space

20000051485 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Renormalization in Quantum Field Theory and the Riemann-Hilbert Problem I. The Hopf Algebra Structure of Graphs and the Main Theorem
Connes, A.; Kreimer, D.; Dec. 1999; 42p
Report No.(s): PB2000-103806; IHES/M/99/91; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper gives a complete self-contained proof of the authors result announced in showing that renormalization in quantum field theory is a special instance of a general mathematical procedure of extraction of finite values based on the Riemann-Hilbert problem. the authors shall first show that for any quantum field theory, the combinatorics of Feynman graphs gives rise to a Hopf algebra H which is as cummutative as an algebra. It is the dual Hopf algebra of the enveloping algebra of Lie algebra G whose basis is labelled by the one particle irreducible Feynman graphs. The Lie bracket of two such graphs is computed from insertions of one graphs in the other and vice versa. The corresponding Lie group G is the group of characters of H.
NTIS
Insertion; Theorems; Quantum Theory

20000052240 Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
Probing large extra dimensions with neutrinos
Dvali, G.; Smirnov, A.; Jun. 30, 1999; 18p; In English
Report No.(s): DE99-627827; IC-99/32; NYU-TH-99/3/03; No Copyright; Avail: Department of Energy Information Bridge

We study implications of theories with sub-millimeter extra dimensions and M(sub f)(approx)(1-10) TeV scale quantum gravity for neutrino physics. In these theories, the left-handed neutrinos as well as other standard model (SM) particles, are localized on a brane embedded in the bulk of large extra space. Mixing of neutrinos with (SM) singlet fermions propagating in the bulk is naturally suppressed by the volume factor M(sub f)/M(sub P)(approx)3(center-dot) 10(sup -16)-3(center-dot)10(sup -15), where M(sub P) is the Planck mass. Properties of the neutrino oscillations and the resonance conversion to the bulk fermions are considered. We show that the resonance conversion of the electron neutrinos to the light bulk fermions can solve the solar neutrino problem. The signature of the solution is the peculiar distortion of the solar neutrino spectrum. The solution implies that the radius of at least one extra dimension should be in the range 0.06-0.1 mm irrespective of total number of extra dimensions. The corresponding modification of the Newtonian law is within the range of sensitivity of proposed sub-millimeter experiments, thus providing a verifiable link between neutrino physics and the gravity measurements.
NTIS
Neutrinos; Quantum Mechanics

20000052241 Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
Supersymmetry breaking and loop corrections at the end of inflation
Jeannerot, R.; Lesgourgues, J.; Jun. 30, 1999; 9p; In English
Report No.(s): DE99-627828; IC-99/43; No Copyright; Avail: Department of Energy Information Bridge

We show that quantum corrections to the effective potential in supersymmetric hybrid inflation can be calculated all the way from the inflationary period - when the Universe is dominated by a false vacuum energy density - till the fields settle down to the global supersymmetric minimum of the potential. These are crucial for getting a continuous description of the evolution of the fields.
NTIS
Supersymmetry; Correction; Broken Symmetry

20000052242 Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
Point mass geometries, spectral flow and AdS3-CFT2 correspondence
David, J. R.; Mandal, G.; Vaidya, S.; Wadia, S. R.; Jun. 30, 1999; 15p; In English
Report No.(s): DE99-627829; IC-99/64; TIFR/TH-99-23; No Copyright; Avail: Department of Energy Information Bridge

We discuss, in terms of the AdS3-CFT2 correspondence, a one-parameter family of (asymptotically AdS3) conical geometries which are generated by point masses and interpolate between AdS3 and BTZ spacetimes. We show that these correspond to spectral flow in N=(4,4)SCFT2 which interpolate between NS and R sectors. Our method involves representing the conical spaces as solutions of three-dimensional supergravity based on the supergroup SU(1,1/2)xSU(1,1/2). The boundary CFT we use is based on the D1/D5 system. The correspondence includes comparing the Euclidean free energies between supergravity and SCFT for the family of conical spaces including BTZ black holes.
Author(NTIS)
Euclidean Geometry; Spectra; Mass Flow

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ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20000046626 Directorate General of Civil Aviation, The Hague, Netherlands
Benchmark Airport Charges
deWit, A., Directorate General of Civil Aviation, Netherlands; Cohn, N., Hague Consulting Group, Netherlands; Journal of Air Transportation World Wide; 1999; ISSN 1093-8826; Volume 4, No. 2, pp. 121-144; In English; Copyright; Avail: Issuing Activity

The Netherlands Directorate General of Civil Aviation (DGCA) commissioned Hague Consulting Group (HCG) to complete a benchmark study of airport charges at twenty eight airports in Europe and around the world, based on 1996 charges. This study followed previous DGCA research on the topic but included more airports in much more detail. The main purpose of this new benchmark study was to provide insight into the levels and types of airport charges worldwide and into recent changes in airport

charge policy and structure, This paper describes the 1996 analysis. It is intended that this work be repeated every year in order to follow developing trends and provide the most up-to-date information possible.
Author
Airports; Policies; Trends; Research

20000047278 Defence Materiel Administration, Stockholm, Sweden
R3 - Management in Demil Operations: Today and Tomorrow
Hoernstroem, Hanna, Defence Materiel Administration, Sweden; Stroemsteadt, Bengt, Defence Materiel Administration, Sweden; Approaches to the Implementation of Environment Pollution Prevention Technologies at Military Bases; April 2000, pp. 16-1 - 16-10; In English; See also 20000047263; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

After World War II surplus munition in Sweden was dumped in lakes, mines and in the open sea. During the late 60's environmental concerns led to a ban on dumping. OB/OD therefore became the main method for demil of munitions. Growing environmental concern in the 70's resulted in a small scale start of industrialized demil which during the 80's steadily increased. During the 90's demil of munition has been characterized by focus on recovery, reuse and recycling. This is due to a more rigorous environmental legislation coupled with an awakening environmental awareness in the Armed Forces and the discovery that an environmentally adapted demil process can be economically beneficial compared to OB/OD. A high degree of resource recovery and reuse (R3) is now obtained in the demil process, but some problems remain e.g. smoke and illuminating ammunition. Some approaches to handle these challenges are discussed. The problem with the old dumpsites are also discussed: a survey has been performed in order to locate the numerous sites and measures are taken to investigate the risk for ecological effects. The dumped ammunition also constitutes a potential safety problem at some of the locations, both with regard to unintentional handling by the public and by potential detonation of unstable munition. (Some results from examination of dumped ammunition are presented). The high focus on R3 in demil operations in Sweden is in line with the political ambition for Sweden to be among the leading nations in the efforts to obtain a sustainable development of society. The Armed Forces and the Defence Materiel Administration are among the governmental authorities actively working to contribute to this strive. The work to implement an environmental management system according to ISO 14001 in the defence sector has started. The government has issued a command to the two authorities to jointly adapt guidelines for environmentally sound provision of defence materiel. The main environmental objective concerning demil in Sweden at present is to totally eliminate the need for OB/OD to dispose of surplus munitions. This method must in the near future be replaced by even more optimal industrial processes focusing on recovering materials, explosives as well as metals, even in those ammunition components where we today still have some problems. State-of-the-art technology is a prerequisite to achieve fully environmentally adapted demil operations, as well as an innovative and life-cycle-oriented way of managing environmental aspects in all processes. International co-operation is of course a valuable tool for sharing knowledge and experience, which is necessary for achieving the best possible demil methods.
Author
Environment Management; Environment Protection; Explosives; Disposal; Recycling; Reuse

20000052475 Technische Hogeschool Twente, Centre for Telematics and Information Technology, Enschede, Netherlands
Transaction and Rule Support for Workflow Management: A Retrospective on the WIDE Architecture
Grefen, P.; Ceri, S.; Sanchez, G.; 1998; 20p; In English
Report No.(s): PB2000-104721; CTIT-TR-98-16; No Copyright; Avail: National Technical Information Service (NTIS)

In the WIDE ESPRIT project, extended database support for workflow management has been developed. This support focuses on advanced transaction and active rule management. In this paper, we discuss the WIDE architecture from a retrospective point of vie. We review major design decisions taken during the project and relate them to the functionality, performance, and maintainability of the developed architecture.
NTIS
Data Base Management Systems; Systems Engineering; Architecture (Computers)

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

20000046618 California Univ., Los Angeles, CA USA
Cooperative and Reactive Agents for Information Systems ***Final Report, Jun. 1998 - Jul. 1999***
Chu, Wesley, California Univ., USA; Feb. 2000; 25p; In English
Contract(s)/Grant(s): F30602-98-C-0145; AF Proj. R427
Report No.(s): AD-A375295; AFRL-IF-RS-TR-2000-9; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Active database systems have received increasing interest from both research and industrial communities. However, trigger conditions in the active rules are often difficult to specify, especially as the complexity of the events and/or condition: increases. to remedy this problem, we propose an active database system that supports rules with conceptual terms, approximate operators, and complex events. The conceptual terms and approximate operators are user and context sensitive. by introducing these high-level constructs, we not only simplify the rule specification process, but also increase the rule expressiveness. Knowledge-based relaxation techniques are used for rule specification and relaxation. High-level concepts and approximate operators used in rules are first relaxed into low-level active rules by using a tree-type knowledge structure called Type Abstraction Hierarchy which can be generated automatically from the database using clustering algorithms. The low-level rules are decomposed into a set of database triggers, which are then submitted into commercial active relational databases for simple trigger-processing. Thus, our proposed high-level active database system supports complex event detection without modification of the underlying database systems. The proposed active database system with high-level rule processing and complex event detection has been implemented at UCLA. The system operates on top of commercial relational databases that demonstrate the feasibility of high-level rule processing and complex event detection.
DTIC
Data Bases; Information Systems; Relational Data Bases; Knowledge Based Systems

20000048272 RAND Corp., National Defense Research Inst., Santa Monica, CA USA
The Global Course of the Information Revolution: Political, Economic, and Social Consequences Proceedings of an International Conference
Hundley, Richard O.; Anderson, Robert H.; Bikson, Tora K.; Dewar, James A.; Green, Jerrold; Jan. 2000; 127p; In English, 16-18 Nov. 1999
Report No.(s): AD-A375901; Copyright; Avail: Defense Technical Information Center (DTIC)

The information revolution is bringing about profound changes in many aspects of life. RAND has embarked on a three-year effort, sponsored by the National Intelligence Council, to chart the future course of these changes over the next 10-20 years, all over the world. As a first step in this effort, RAND convened a conference on political/ governmental, business/ financial, and social/cultural trends driven by the information revolution, as they manifest themselves in various nations and regions. This conference was held in Washington, DC on November 16-18, 1999, with participants from North America, Europe, and the Asian Pacific region, covering a broad cross section of intellectual disciplines.
DTIC
Conferences; Economics; Information Systems

20000052245 Risoe National Lab., Information Service Dept., Roskilde, Denmark
Risoe publication activities in 1998
Bennov, S.; Apr. 30, 1999; 70p; In English
Report No.(s): DE99-627847; RISO-R-1097EN; ISBN 87-550-2504-8; No Copyright; Avail: Department of Energy Information Bridge

The report contains a list of references to the scientific and technical journal articles, books, reports, lectures published in full text, and to publications for a broader readership authored by researchers at Risoe National Laboratory and published in 1998. If the publication mentioned in the reference is electronically available the link to the web-address is added. The references are organized according to the programme areas of Risoe. The text is introduced by total number of publications, distribution of types of publications, number of citations to the international scientific journal articles, institutions with which Risoe has published the largest number of articles, and journals in which Risoe has published most articles. The data are derived from Risoe's in-house

Publications Database and from the Risoe Institutional Citation Report database produced by the Institute for Scientific Information.
NTIS
Bibliographies; Information Dissemination

20000052467 NASA Goddard Space Flight Center, Greenbelt, MD USA
EEE Links, Volume 5
Humphrey, Robert, Editor, NASA Goddard Space Flight Center, USA; October 1999; 22p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The EEE Links Newsletter is a quarterly publication produced by Code 562 in support of the NASA HQ funded NASA Electronic Parts and Packaging (NEPP) Program. The newsletter is produced as an electronic format deliverable made available via the referenced www site administered by Code 562, The newsletter publishes brief articles on topics of interest to NASA programs and projects in the area of electronic parts and packaging. The newsletter does not provide information pertaining to patented or proprietary information. The information provided is at the level of that produced by industry and university researchers and is published at national and international conferences.
Author
Electronic Packaging; Periodicals; Spare Parts

20000052480 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
Customs Service Modernization: Actions Needed to Correct Serious ACE Management and Technical Weaknesses. Statement of Randolph C. Hite, Associate Director, Governmentwide and Defense Information Systems, Accounting and Information Management Divisio
Apr. 13, 1999; 18p; In English
Report No.(s): PB2000-104223; GAO/T-AIMD-99-141; No Copyright; Avail: National Technical Information Service (NTIS)

This report focuses on Custom's Automated Commercial Environment, better known as ACE. Through ACE, Customs intends to implement much needed improvements in the way it currently enforces import trade laws and regulations and assesses and collects import duties, taxes, and fees, which total $22 billion annually. The need to leverage information technology to improve the way that Customs does business in the import arena is undeniable. Customs' existing import processes and supporting systems are simply not responsive to the business needs of either Customs or the trade community, whose members collectively import about $1 trillion in gods annually. These existing processes and systems are paper-intensive, error-prone, and transaction-based, and they are out of step with the just-in-time inventory practices used by the trade. Recognizing this, the Congress enacted the Customs Modernization and Informed Compliance Act, or 'Mod' Act, to define legislative requirements for improving import processing through an automated system.
NTIS
Information Systems; Systems Management; Congressional Reports

20000052493 NASA Goddard Space Flight Center, Greenbelt, MD USA
NOAA/NASA/DOD Workshop on Satellite Data Assimilation
Errico, Ronald M., National Center for Atmospheric Research, USA; Ohring, George, National Environmental Satellite Service, USA; Derber, John, National Centers for Environmental Prediction, USA; Joiner, Joanna, NASA Goddard Space Flight Center, USA; [2000]; 9p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A workshop on the assimilation of satellite sounding information using global forecast and climate models was held at College Park, MD, 23-25 August 1999. Topics discussed included: comparisons of assimilations of satellite retrievals versus satellite-observed radiances, planning for the use of advanced infrared sounders, the use of satellite sounding data affected by land surfaces, radiative transfer issues, and error characteristics of models and observations. The workshop concluded with a number of general and specific recommendations to advance the state of the art of assimilation of satellite sounding data.
Author
Conferences; Data Acquisition; Assimilation; Error Analysis; Radiative Transfer; Satellite Sounding

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TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see 03 Air Transportation and Safety, 16 Space Transportation and Safety, and 44 Energy Production and Conversion. For specific technology transfer applications see also the category where the subject is treated.

20000048636 Osaka Univ., Faculty of Engineering, Osaka, Japan
Urban Traffic Performance Optimization Based on Pollution Reduction
Ma, Liying, Osaka Univ., Japan; Matsumura, Nobuhiko, Delft Univ. of Technology, Netherlands; Mori, Yasuo, Osaka Univ., Japan; Akinyemi, Eddy O., Delft Univ. of Technology, Netherlands; Technology Reports of the Osaka University; Apr. 15, 2000; ISSN 0030-6177; Volume 50, No. 2375, pp. 71-82; In English; Copyright; Avail: Issuing Activity

A computer model has been developed to optimize the traffic operation performance in terms of total passenger productive capacity under the most satisfied local environmental conditions. In this paper, the emission modeling under four operating movements (cruising, decelerating, idling and accelerating) is discussed in detail since excessive emissions are normally produced at/near a junction. The results of the model application for three Scenarios are analyzed in aspects of concentration of pollutants, noise level and total passenger productive capacity.
Author
Urban Transportation; Traffic; Computerized Simulation; Air Pollution

20000051481 Department of Transportation, Washington, DC USA
How to Keep America Moving (ISTEA). Transportation for the 21st Century. Report on the U.S. Department of Transportation's Outreach on Reauthorization of the Intermodal Surface Transportation Efficiency Act (ISTEA)
Camph, D. H.; Siwek, S.; Forestieri, F.; Jan. 20, 1997; 60p
Report No.(s): PB2000-104083; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The most important statement the Clinton Administration will make on the future of the Nations transportation system will be our proposal for the reauthorization of the Intermodal Surface Transportation Efficiency Act (ISTEA). DOT intends to submit legislation to the Congress in early 1997. to help us prepare that proposal, the U.S. Department of Transportation conducted a national outreach program to gather citizen input at the State and local levels. We held regional Forums in every section of the country and convened over one hundred focus groups in 40 States. This Administration believes that we are here to serve our customers and listen carefully to their views. This report provides a summary of the major themes highlighted by participants during this outreach and is intended to serve as a resource during consideration of ISTEAs reauthorization.
NTIS
Transportation; Surface Vehicles; Law (Jurisprudence)

20000052479 National Inst. of Standards and Technology, Advanced Technology Program, Gaithersburg, MD USA
Estimating Social and Private Returns from Innovations Based on the Advanced Technology Program: Problems and Opportunities
Mansfield, E.; Jan. 1996; 54p; In English
Report No.(s): PB2000-104377; NIST/GCR-99-789; No Copyright; Avail: National Technical Information Service (NTIS)

Even the most sophisticated firms have found it very difficult to forecast the private returns from R and D projects. In part, this is because it is so hard to predict how effectively the results of such a project will be exploited. In addition, because of the uncertainties inherent in R and D (as well as the inevitable biases due to organizational pressures and the perceived need to sell projects), the forecasts of development cost and time, probabilities of success, and profits seem to contain substantial errors and biases (at least based on the available, but old, data). Choosing projects which are close to commercialization, or where the technology is being commercialized, for study will improve the quality of the forecast.
NTIS
Technology Utilization; Marketing

88
SPACE AND INFORMATION SCIENCES (GENERAL)

20000048256 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Magnetospheric Multiscale Mission...Resolving Fundamental Processes in Space Plasmas
Curtis, S., NASA Goddard Space Flight Center, USA; December 1999; 56p; In English; Original contains color illustrations
Report No.(s): NASA/TM-2000-209883; NAS 1.15:209883; Rept-2000-01130-0; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Magnetospheric Multiscale (MMS) mission is a multiple-spacecraft Solar-Terrestrial Probe designed to study the microphysics of magnetic reconnection, charged particle acceleration, and turbulence in key boundary regions of Earth's magnetosphere. These three processes, which control the flow of energy, mass, and momentum within and across plasma boundaries, occur throughout the universe and are fundamental to our understanding of astrophysical and solar system plasmas. Only in Earth's magnetosphere, however, are they readily accessible for sustained study through in-situ measurement. MMS will employ five co-orbiting spacecraft identically instrumented to measure electric and magnetic fields, plasmas, and energetic particles. The initial parameters of the individual spacecraft orbits will be designed so that the spacecraft formation will evolve into a three-dimensional configuration near apogee, allowing MMS to differentiate between spatial and temporal effects and to determine the three dimensional geometry of plasma, field, and current structures. In order to sample all of the magnetospheric boundary regions, MMS will employ a unique four-phase orbital strategy involving carefully sequenced changes in the local time and radial distance of apogee and, in the third phase, a change in orbit inclination from 10 degrees to 90 degrees. The nominal mission operational lifetime is two years. Launch is currently scheduled for 2006.
Author
Earth Magnetosphere; Space Plasmas; Space Probes; Charged Particles; Magnetic Field Reconnection; Solar System

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ASTRONOMY

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20000048810 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Optical Communications Study for the Next Generation Space Telescope
Ceniceros, Juan M., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 9p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Next Generation Space Telescope (NGST), part of NASA's Origins program, is a follow on to the Hubble Space Telescope expected to provide timely new science along with answering fundamental questions. NGST is a large diameter, infrared optimized telescope with imaging and spectrographic detectors which will be used to help study the origin of galaxies. Due to the large data NGST will collect, Goddard Space Flight Center has considered the use of optical communications for data downlink. The Optical Communications Group at the Jet Propulsion Laboratory has performed a study on optical communications systems for NGST. The objective of the study was to evaluate the benefits gained through the use of optical communication technologies. Studies were performed for each of four proposed NGST orbits. The orbits considered were an elliptical orbit about the semi stable second Lagrangian point, a 1 by 3 AU elliptic orbit around the sun, a 1 AU drift orbit, and a 1 AU drift orbit at a 15 degree incline to the ecliptic plane. An appropriate optical communications system was determined for each orbit. Systems were evaluated in terms of mass, power consumption, size, and cost for each of the four proposed orbits.
Author
Research; Optical Communication; Hubble Space Telescope; Imaging Techniques

20000052203 NASA Goddard Space Flight Center, Greenbelt, MD USA
Operational Considerations when Designing New Ground Systems
Walyus, Keith, NASA Goddard Space Flight Center, USA; Barbahenn, George, Lockheed Martin Technical Operations, Inc., USA; Crabb, William, Allied-Signal Technical Services Corp., USA; Miebach, Manfred, Space Telescope Science Inst., USA; Pataro, Peter, Lockheed Martin Technical Operations, Inc., USA; [2000]; 1p; In English; Space Ops, 2000, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The Hubble Space Telescope (HST) launched in April of 1991 with a nominal 15-year old mission. Since then, the HST mission life has been extended to 2010. As is true for all NASA missions, HST is being asked to decrease its operational costs for

the remainder of its mission life. Various techniques are being incorporated for cost reductions, with one of the core means being the design of a new and more efficient ground system for HST operations. This new ground system, ”Vision 2000”, will reduce operational and maintenance costs and also provide the HST Project with added flexibility to react to future changes. Vision 2000 began supporting HST Operations in January of 1999 and will support the mission for the remainder of the mission life. Upgrading a satellite’s ground system is a popular approach for reducing costs, but it is also inherently risky. Validating a new ground system can be a severe distraction to a flight team while operating a satellite. Mission data collection and health and safety requirements are rarely, if ever, relaxed during this validation period, forcing flight teams to undertake an additional task while operating the satellite. Additionally, flight teams must usually undergo extensive training to effectively utilize the new system. Once again, this training usually occurs as an additional task, in addition to the nominal satellite operations. While operating the spacecraft, the Flight Team typically assists in the design, validation, and verification of a new ground system. This is a distraction and strain on the Flight Team, but the benefit of using the Flight Team in all phases of ground system development far outweigh the negative aspects. Finally, above the cost of the new system, the integration into the facility with the current control center system are resources and costs not normally taken into account in the design phase of the new system. In addition to the standard issues faced by a Project when upgrading its ground system, the HST Project also must continue to support Space Shuttle servicing missions, which occur approximately every two to three years. This paper will address many of the issues common to all missions when re-hosting ground systems, and those faced by the HST Project in particular.
Author
Cost Reduction; Ground Operational Support System; Systems Engineering; Operating Costs; Maintenance; Data Acquisition

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20000046604 Oxford Univ., Dept. of Physics, Astrophysics, Oxford, UK
IRAS F10214+4724: The Inner 100pc
Lacy, Mark, Oxford Univ., UK; Rawlings, Steve, Oxford Univ., UK; Serjeant, Stephen, Imperial Coll. of Science and Technology, UK; Jun. 04, 1998; 18p; In English
Report No.(s): OUAST/98/11; Copyright; Avail: Issuing Activity

We use new high resolution near-infrared spectroscopy and our previously published optical spectroscopy of the gravitationally-lensed Seyfert-2 galaxy F10214+4724 to study both the links between the starburst and AGN in this object and the properties of the line-emitting clouds in the inner narrow-line region. Close inspection of the rest-frame UV spectrum reveals interstellar or stellar absorption features consistent with a compact, moderately-reddened starburst providing about half the UV light, and explaining the dilution of the UV continuum polarisation relative to the broad emission lines. Spectroscopy of the Halpha/[NII] line blend has enabled us to assess the relative contributions of the emission from the narrow-line region of the Seyfert-2, and a moderately-reddened emission line region which we argue is associated with the starburst activity. Estimates of the star formation rate from the unpolarized UV continuum flux and the Halpha flux are consistent to within their associated uncertainties. We find we can plausibly explain the unusual emission line properties of F10214+4724 in terms of conventional models for nearby Seyfert-2 galaxies if lensing is preferentially magnifying the side of the inner narrow-line region between the AGN and the observer, and the other side is both less magnified and partially obscured by the torus. The hydrogen densities of clouds in this region are high enough to make the Balmer lines optically thick and to suppress forbidden emission lines with low critical densities. From the emission-line spectrum we have deduced the column density of both ionized and neutral gas in the narrow-line clouds, and the density of the ionized gas. Using these we have been able to estimate the mass of the inner narrow-line clouds to be approx. 1 solar mass, and show that the gas:dust ratio N (sub H)/E(B- V) in these clouds must be approx. 1.3 x 10 (exp 27) m (exp -2) mag (exp -1) significantly higher than average value in the Milky Way, approx. 4.5 x 10 (exp 25) m (exp -2) mag (exp -1). The column density and low dust content of a typical cloud are consistent with the properties of the warm absorbers seen in the X-ray spectra of Seyfert-1 galaxies. Our results thus favor models in which the narrow line clouds start life close to the nucleus and flow out. An emission line from the lensing system has allowed us to confirm its redshift as z approximately equal to 0.9.
Author
Infrared Astronomy Satellite; Seyfert Galaxies; Near Infrared Radiation; Spectroscopy; Active Galactic Nuclei; Ultraviolet Spectra; Emission Spectra

20000046605 Oxford Univ., Dept. of Physics, Astrophysics, Oxford, UK

The central engines of radio-quiet quasars

Blundell. Katherine M., Oxford Univ., UK; Beasley, Anthony J., National Radio Astronomy Observatory, USA; May 18, 1998; 12p; In English

Report No.(s): OUAST/98/9; Copyright; Avail: Issuing Activity

Two rival hypotheses have been proposed for the origin of the compact radio flux observed in radio-quiet quasars (RQQs). It has been suggested that the radio emission in these objects, typically some two or three orders of magnitude less powerful than in radio-loud quasars (RLQs), represents either emission from a circumnuclear starburst or is produced by radio jets with bulk kinetic powers approximately 10(exp 3) times lower than those of RLQs with similar luminosity ratios in other wavebands. We describe the results of high resolution (approximately parsec-scale) radio-imaging observations of a sample of 12 RQQs using the Very Long Baseline Array (VLBA). We find strong evidence for jet-producing central engines in 8 members of our sample. Author

Radio Emission; Quasars; Radio Jets (Astronomy); Radio Astronomy; Radio Observation; Continuums; Active Galaxies; Starburst Galaxies

20000048492 NASA Goddard Space Flight Center, Greenbelt, MD USA

Theory and Observations of Non-Thermal Phenomena in Hot Massive Binaries

White, Richard L., Space Telescope Science Inst., USA; Chen, Wan, NASA Goddard Space Flight Center, USA; Wolf-Rayet Stars: Binaries, Colliding Winds, Evolution; [1995], pp. 438-449; In English; Copyright; Avail: Issuing Activity

The shock between the colliding winds in binary systems containing two massive stars accelerates particles to relativistic energies. These energetic particles can produce observable non-thermal radiation from the radio to gamma-rays. The important physical processes in such systems are very similar to those we have proposed for non-thermal emissions from single hot stars, which have shocks generated by instabilities in the radiatively driven stellar winds. This paper discusses the theory and observations of non-thermal radiation in the radio, X-ray, and gamma-ray regions from both single stars and massive binaries. Similarities and differences between the two types of systems are outlined. We discuss two important physical effects that apparently have been neglected in previous theoretical work on colliding wind binaries.

Author

Hot Stars; Binary Stars; Massive Stars; Stellar Winds; Nonthermal Radiation; Radio Observation

20000050247 Department of Energy, Office of Energy Research, Washington, DC USA

Astrophysical search strategies for accelerator blind dark matter

Wells, J. D.; Apr. 30, 1998; 7p; In English; 3rd; Sources and distributions of dark matter in the universe (DM 98)

Report No.(s): DE98-059215; SLAC-PUB-7807; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A weakly interacting dark matter particle may be very difficult to discover at an accelerator because it either (1) is too heavy, (2) has no standard model gauge interactions, or (3) is almost degenerate with other states. In each of these cases, searches for annihilation products in the galactic halo are useful probes of dark matter properties. Using the example of supersymmetric dark matter, the author demonstrates how astrophysical searches for dark matter may provide discovery and mass information inaccessible to collider physics programs such as the Tevatron and LHC.

NTIS

Astrophysics; Dark Matter

20000050470 NASA Goddard Space Flight Center, Greenbelt, MD USA

Evidence of Lunar Phase Influence on Global Surface Air Temperatures

Anyamba, Ebby, General Sciences Corp., USA; Susskind, Joel, NASA Goddard Space Flight Center, USA; [2000]; 15p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 406-04-00-01; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Intraseasonal oscillations appearing in a newly available 20-year record of satellite-derived surface air temperature are composited with respect to the lunar phase. Polar regions exhibit strong lunar phase modulation with higher temperatures occurs near full moon and lower temperatures at new moon, in agreement with previous studies. The polar response to the apparent lunar forcing is shown to be most robust in the winter months when solar influence is minimum. In addition, the response appears to be influenced by ENSO events. The highest mean temperature range between full moon and new moon in the polar region between 60 deg and 90 deg latitude was recorded in 1983, 1986/87, and 1990/91. Although the largest lunar phase signal is in the polar

regions, there is a tendency for meridional equatorward progression of anomalies in both hemispheres so that the warning in the tropics occurs at the time of the new moon.
Author
Lunar Phases; Moon; Oscillations; Phase Modulation; Surface Temperature; Tropical Regions

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

20000045685 Colorado Univ., Lab. for Atmospheric and Space Physics, Boulder, CO USA
Small-Scale Polygons and the History of Ground Ice on Mars, ***15 Feb. 1998 - 14 Feb. 2000***
Mellon, Michael T., Colorado Univ., USA; [2000]; 2p; In English
Contract(s)/Grant(s): NAG5-7071; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This research has laid a foundation for continued study of permafrost polygons on Mars using the models and understanding discussed here. Further study of polygonal patterns on Mars is proceeding (under new funding) which is expected to reveal more results about the origin of observed martian polygons and what information they contain regarding the recent history of tile martian climate and of water ice on Mars.
Author
Ice; Mars Surface; Polygons; Scale (Ratio)

20000045687 California Univ., Dept. of Mechanical Engineering, Berkeley, CA USA
The Formation and Maintenance of the Zonal Winds of Jupiter and Saturn ***Final Report, 1 Apr. 1995 - 31 Mar. 1998***
Marcus, Philip S., California Univ., USA; [1998]; 3p; In English
Contract(s)/Grant(s): NSF AST-94-23305; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The goal of this research was to understand the alternating zonal (east-west) winds or jet streams of the large gaseous planets whose atmospheres (at their weather layers) are dominated by them - even more so than by their long-lived vortices such as the Great Red Spot. A goal was to develop a complete theory that would explain how and why the jets would form and how they were maintained. We choose to pursue a mathematically rigorous explanation. We used both mathematical analysis and large-scale numerical simulation to develop and test theories. Most other investigators who have examined this problem have either assumed that the differential heating from the sun creates the jet streams or have approached the problem as a 'run-down' numerical experiment in which the planet's atmosphere is initially filled with a random vortex field and allowed to evolve with no forcing and only small-scale dissipation. We were motivated to try a new approach because we were able to show that the former approach fails to produce stable zonal winds of a type found on the gaseous planets, while the latter is unrealistic in its initial assumptions and eventually leads to solid-body rotation. Because planetary data is often ambiguous, we were motivated to cast our predictions and results in a way such that laboratory experiments could support or refute them.
Derived from text
Jupiter Red Spot; Saturn (Planet); Weather; Wind (Meteorology); Simulation; Streams; Vortices; Numerical Analysis

20000052454 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Venus Aerobot Multisonde Mission
Cutts, James A., Jet Propulsion Lab., California Inst. of Tech., USA; Kerzhanovich, Viktor, Jet Propulsion Lab., California Inst. of Tech., USA; Balaram, J. Bob, Jet Propulsion Lab., California Inst. of Tech., USA; Campbell, Bruce, NASA, USA; Gershaman, Robert, Jet Propulsion Lab., California Inst. of Tech., USA; Greeley, Ronald, Arizona Univ., USA; Hall, Jeffery L., Jet Propulsion Lab., California Inst. of Tech., USA; Cameron, Jonathan, Jet Propulsion Lab., California Inst. of Tech., USA; Klaasen, Kenneth, Jet Propulsion Lab., California Inst. of Tech., USA; Hansen, David M., Jet Propulsion Lab., California Inst. of Tech., USA; 1999; 10p; In English; AIAA Balloon Technology Conference, 1999, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Robotic exploration of Venus presents many challenges because of the thick atmosphere and the high surface temperatures. The Venus Aerobot Multisonde mission concept addresses these challenges by using a robotic balloon or aerobot to deploy a number of short lifetime probes or sondes to acquire images of the surface. A Venus aerobot is not only a good platform for precision deployment of sondes but is very effective at recovering high rate data. This paper describes the Venus Aerobot Multisonde concept and discusses a proposal to NASA's Discovery program using the concept for a Venus Exploration of Volcanoes and Atmo-

sphere (VEVA). The status of the balloon deployment and inflation, balloon envelope, communications, thermal control and sonde deployment technologies are also reviewed.
Author
Mission Planning; Venus (Planet); Robotics; Balloons; Deployment

20000052460 Proxemy Research, Inc., Laytonsville, MD USA
Volcanic Plumes on Venus and Io ***Final Report, 1-30 Apr. 2000***
Glaze, Lori S., Proxemy Research, Inc., USA; Apr. 30, 2000; 46p; In English
Contract(s)/Grant(s): NASW-98012
Report No.(s): PRI-TR-V00-005; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Proxemy Research is under contract to NASA to perform science research of volcanic plumes on Venus and lo. This report is submitted in accordance with contract NASW -98012 and contains a summary of activities conducted over the time period indicated. In addition to a synopsis of science research conducted, any manuscripts submitted for publication in this time period are also attached. Abstracts to scientific conferences may also be included if appropriate.
Author
Research; Volcanoes; Venus (Planet)

20000052461 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Mars Aerobot Micromission
Greeley, Ronald, Arizona State Univ., USA; Cutts, James A., Jet Propulsion Lab., California Inst. of Tech., USA; Arvidson, Raymond, Washington Univ., USA; Blamont, Jacques, Centre National d'Etudes Spatiales, France; Blaney, Diana L., Jet Propulsion Lab., California Inst. of Tech., USA; Cameron, Jonathon, Jet Propulsion Lab., California Inst. of Tech., USA; Kerzhanovich, Viktor, Jet Propulsion Lab., California Inst. of Tech., USA; Smith, I. Steve, NASA Wallops Flight Facility, USA; Yavrouian, Andre, Jet Propulsion Lab., California Inst. of Tech., USA; [1999]; 2p; In English; Mars Exploration Programme and Sample Return Missions: Mars Micromissions Workshop, 1-2 Feb. 1999, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Mars Aerobot Micromission is almost a factor of 10 smaller than earlier concepts for a Mars balloon. A key goal is to achieve high payload mass fraction in a small total systems mass and to maximize the scientific potential of that payload. Scientific objectives include studies of the surface with a high resolution stereo imaging magnetometer and investigations of the structure and dynamics of the atmosphere with an in situ meteorology payload.
Author
Meteorology; Mars (Planet); Mars Atmosphere; Mars Surface; Planetary Meteorology; Atmospheric Circulation; Planetary Magnetic Fields

20000052462 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Technology Validation Program for Mars Aerobot Micromission
Cutts, J., Jet Propulsion Lab., California Inst. of Tech., USA; Kerzhanovich, V., Jet Propulsion Lab., California Inst. of Tech., USA; Bachelder, A., Jet Propulsion Lab., California Inst. of Tech., USA; Patzold, J., Jet Propulsion Lab., California Inst. of Tech., USA; Cameron, J., Jet Propulsion Lab., California Inst. of Tech., USA; Hall, J., Jet Propulsion Lab., California Inst. of Tech., USA; Jones, J., Jet Propulsion Lab., California Inst. of Tech., USA; Weiss, J., Jet Propulsion Lab., California Inst. of Tech., USA; Yavrouian, A., Jet Propulsion Lab., California Inst. of Tech., USA; [1999]; 2p; In English; Mars Exploration Programme and Sample Return Missions: Mars Micromissions Workshop, 1-2 Feb. 1999, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Mars Aerobot Validation Program (MABVAP) was initiated in August 1997 to develop and validate key technologies needed for aerobot missions on Mars. The major elements of the program are the development of balloons for flight on Mars, robust techniques for deployment and inflation and modeling and simulation of balloon flight paths, selection, development and tests of available balloon materials, design and fabrication of balloons (both superpressure and solar-heated), design and fabrication of deployment and inflation systems for aerial deployment, design and fabrication of avionics to control deployment/inflation process and to get telemetry and video data. The program includes laboratory, wind tunnel, vacuum chamber tests of the system components and a number of tropospheric and stratospheric flight tests of deployment and inflation of light-film balloons in a simulated Martian environment Key issues in the design include: the use of proven materials or their combinations; the availability of adequate balloon fabrication technologies and processes; evacuation of gas from the balloon prior to packaging and the design of a balloon container capable of storing the balloon over a wide range of ambient pressures. Tests that have been made at JPL

and at the Vertical Wind Tunnel at NASA Langley Research Center clarified many of the first order issues discussed above and lead to the baseline configuration with inflation from the bottom without a reefing mechanism.
Derived from text
Technology Assessment; Fabrication; Balloon Flight; Mars Environment; Wind Tunnel Tests; Video Data; Simulation

20000052463 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Architectural Design for a Mars Communications and Navigation Orbital Infrastructure
Ceasrone R. J., Jet Propulsion Lab., California Inst. of Tech., USA; Hastrup, R. C., Jet Propulsion Lab., California Inst. of Tech., USA; Bell, D. J., Jet Propulsion Lab., California Inst. of Tech., USA; Roncoli, R. B., Jet Propulsion Lab., California Inst. of Tech., USA; Nelson, K., Stanford Telecommunications, Inc., USA; [1999]; 2p; In English; Astrodynamics Specialist Conference, 16-18 Aug. 1999, Girdwood, AK, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The planet Mars has become the focus of an intensive series of missions that span decades of time, a wide array of international agencies and an evolution from robotics to humans. The number of missions to Mars at any one time, and over a period of time, is unprecedented in the annals of space exploration. to meet the operational needs of this exploratory fleet will require the implementation of new architectural concepts for communications and navigation. to this end, NASA's Jet Propulsion Laboratory has begun to define and develop a Mars communications and navigation orbital infrastructure. This architecture will make extensive use of assets at Mars, as well as use of traditional Earth-based assets, such as the Deep Space Network, DSN. Indeed, the total system can be thought of as an extension of DSN nodes and services to the Mars in-situ region. The concept has been likened to the beginnings of an interplanetary Internet that will bring the exploration of Mars right into our living rooms. The paper will begin with a high-level overview of the concept for the Mars communications and navigation infrastructure. Next, the mission requirements will be presented. These will include the relatively near-term needs of robotic landers, rovers, ascent vehicles, balloons, airplanes, and possibly orbiting, arriving and departing spacecraft. Requirements envisioned for the human exploration of Mars will also be described. The important Mars orbit design trades on telecommunications and navigation capabilities will be summarized, and the baseline infrastructure will be described. A roadmap of NASA's plan to evolve this infrastructure over time will be shown. Finally, launch considerations and delivery to Mars will be briefly treated.
Author
Mars Missions; Mission Planning; Interplanetary Communication

20000052470 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Navigating Mars Global Surveyor Through the Martian Atmosphere: Aerobraking 2
Esposito, P., Jet Propulsion Lab., California Inst. of Tech., USA; Alwar, V., Jet Propulsion Lab., California Inst. of Tech., USA; Burkhart, P., Jet Propulsion Lab., California Inst. of Tech., USA; Demcak, S., Jet Propulsion Lab., California Inst. of Tech., USA; Graat, E., Jet Propulsion Lab., California Inst. of Tech., USA; Johnston, M., Jet Propulsion Lab., California Inst. of Tech., USA; Portock, B., Jet Propulsion Lab., California Inst. of Tech., USA; [1999]; 7p; In English; Astrodynamics, 16-18 Aug. 1999, Girdwood, AK, USA; Sponsored by American Astronautical Society, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Mars Global Surveyor (MGS) spacecraft was successfully inserted into an elliptical orbit around Mars on 9/12/97, 01:53:49 UTC. This orbit was near polar (inclination=93.26 deg) with an orbital period of 44.993 hours and apoapsis and periapsis altitudes of 54,025.9 km and 262.9 km respectively. After 201 orbits and 196 days after Mars orbit insertion, the first phase of aerobraking (AB), called AB 1, has ended; after the AB 1 termination maneuver, the orbital period was 11.64 hours with apoapsis and periapsis altitudes of 17,870.3 and 170.7 Ian respectively. Thereafter, MGS was in a science phasing orbit (SPO) and acquired data from the science instruments from 3/28/98 to 9/22/98 (orbits 202 through 572). The second phase of aerobraking (AB2) began on 9/23/98 with the first descent into the atmosphere on P574 and ended with the aerobraking termination maneuver (ABX) on 2/4/99 on A 1284. Just prior to ABX, the apoapsis and periapsis altitudes were 456.5 km and 116.7 km respectively with an orbit period of 1.973 hours, a local mean solar time (LMST) at the descending node of 2 hours, 3.6 minutes and an inclination of 92.9 degrees. AB was responsible for circularization of the MGS orbit. However, two additional orbital conditions had to be satisfied simultaneously. These were a) complete AB2 when the LMST at the descending node was close to 2:00 am and b) the inclination was at 93.0 degrees. This paper describes the navigation of MGS throughout AB2; a companion paper describes the strategy and plan for aerobraking. Navigation challenges involved: a) the estimation of an atmospheric density model for every drag pass or periapsis-passage by analyzing doppler tracking data, b) the generation of a short-term, that is over one to several orbits, accurate atmospheric density predictions, c) maintaining the spacecraft's orbit within upper and lower bounds of atmospheric density or dynamic pressure during each periapsis-passage, and d) the prediction of accurate periapsis-passage times (Tp) over one to fifteen orbits. The density estimation and analysis procedure, evaluation of almost 700 atmospheric densities throughout AB2, the varia-

tion and accuracy of density predictions, the Tp prediction accuracy and how effectively we terminated AB2 are the basis of this paper and shall be presented in detail. A summary overview of AB2 is given.
Derived from text
Navigation; Maps; Mars (Planet); Orbit Insertion; Dynamic Pressure; Atmospheric Density

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see 52 Aerospace Medicine. For theory see 73 Nuclear Physics.

20000048493 NASA Goddard Space Flight Center, Greenbelt, MD USA
Particle Acceleration, X-Rays, and Gamma-Rays From Winds
White, Richard L., Space Telescope Science Inst., USA; Chen, Wan, NASA Goddard Space Flight Center, USA; Astrophysics and Space Science; 1994; Volume 221, pp. 295-307; In English; Copyright; Avail: Issuing Activity

The instability of the line-driven winds of hot stars leads to the formation of strong shocks. These shocks not only emit thermal X-rays, but also accelerate a small fraction of the thermal electrons and ions to relativistic energies. Synchrotron radiation from these energetic particles can account for the non-thermal radio emission observed from some hot stars, and can also explain the hard X-rays detected in the Einstein X-ray spectra. Our calculations indicate that the gamma-ray emission from non-thermal particles should be detectable by GRO. The detection (or non-detection) of these emissions over a wide energy range, from the radio to gamma-rays, should provide a great deal of information on the structure of the unstable winds and the physics of particle acceleration by shocks.
Author
Gamma Rays; Particle Acceleration; X Rays; Stellar Winds; Hot Stars

20000048503 NASA Goddard Space Flight Center, Greenbelt, MD USA
Nonthermal Radio Emission from Hot Star Winds: Its Origin and Physical Implications
Chen, Wan, NASA Goddard Space Flight Center, USA; White, Richard L., Space Telescope Science Inst., USA; Astrophysics and Space Science; 1994; Volume 221, pp. 259-272; In English; Copyright; Avail: Issuing Activity

Nonthermal radio emission has been observed from some of the most luminous hot star winds. It is understood to be synchrotron radiation of the relativistic electrons in the winds. to understand how the electrons are accelerated to such high energies and to correctly explain the observed radio flux and spectra require an exhaustive investigation of all the relevant physical processes involved and possibly point to a complex wind structure. In this paper we discuss the logical path toward a comprehensive model of the nonthermal radio emission from hot star winds. Based on the available observational data and fundamental theoretical considerations, we found that the only physically viable and self-consistent scenario is: the nonthermal radio emission is synchrotron radiation of relativistic electrons (left right harpoon) the electrons are accelerated by shocks via the first-order Fermi mechanism (left right harpoon) the acceleration has to be in situ in the radio emitting region (left right harpoon) the shocks formed at the base of the winds have to propagate to beyond the radio photosphere.
Author
Radio Emission; Hot Stars; Observation; Nonthermal Radiation; High Energy Electrons; Wind Effects

20000050367 Space Telescope Science Inst., Baltimore, MD USA
Gamma Ray Emission from Chaotic Winds of Massive Stars ***Final Report, Jan. 1992 - Jul. 1996***
White, Richard L., Space Telescope Science Inst., USA; [2000]; 3p; In English
Contract(s)/Grant(s): NAG5-2031; STScI Proj. J0742; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The purpose of this proposal was to search for gamma-ray emission from the winds of hot, massive stars. According to our theoretical calculations, shocks in the winds of massive stars accelerate particles to high energies. The high-energy particles emit synchrotron radio emission (observed by ground-based radio telescopes) and high-energy gamma-ray emission that we predicted should be detectable by the EGRET instrument on the Compton Gamma Ray Observatory between 100 MeV and a few GeV. We obtained EGRET from phases 1, 2, and 3 of the Cygnus OB2 association, a cluster of massive, young stars, to search for this gamma-ray emission. The data products and analysis show a source consistent with the position of Cyg OB2 with approximately the predicted count rate and spectrum.
Derived from text
Gamma Rays; Emission Spectra; Observation; Wind Effects; Heat Transmission; Hot Stars; X Ray Sources

20000050369 NASA Goddard Space Flight Center, Greenbelt, MD USA

Possible Detection of Pi(exp 0)-Decay Gamma-Ray Emission from Cyg OB2 by EGRET

Chen, W., NASA Goddard Space Flight Center, USA; White, R. L., Space Telescope Science Inst., USA; Bertsch, D., NASA Goddard Space Flight Center, USA; Astronomy and Astrophysics Supplement Series; Dec. 03, 1996; Volume 120, pp. 423-426; In English; Copyright; Avail: Issuing Activity

We report possible detection of pi (exp 0) decay radiation from Cyg OB2, a nearby (1.7 kpc) massive OB star association. The EGRET flux (greater than 100 MeV) maps clearly indicate a point source whose error circle includes both Cyg OB2 and Cyg X-3. We show that Cyg X-3 is unlikely to be the counterpart for the EGRET source, because of the marginal spatial consistency and the lack of the 4.8 hour modulation seen in other high energy emissions from Cyg X-3. If confirmed, this will be the first detection by EGRET of massive stars.

Author

Cygnus Constellation; Gamma Ray Observatory; B Stars; O Stars; Gamma Rays; Radioactive Decay

99
GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20000044882 Rutherford Appleton Lab., Chilton, UK

ISIS 99: The Rutherford Appleton Laboratory ISIS Facility Report 1998-99 ***Annual Report, 1 Apr. 1998 - 31 Mar. 1999***

The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999; 114p; In English; See also 20000044883 through 20000044907; CD-ROM contains full text document in PDF format

Report No.(s): RAL-TR-1999-050; Copyright; Avail: Issuing Activity

ISIS is the major facility at the CLRC's Rutherford Appleton Laboratory site. The source was approved in 1977, first neutrons were produced in late 1984 and ISIS was officially inaugurated in October 1985. Over the past decade, ISIS has attracted substantial international investment and has developed into a major international force in condensed matter research.

Derived from text

Research Facilities; Laboratories; International Cooperation; Investments

20000046786 NASA Langley Research Center, Hampton, VA USA

A Historical Perspective on Dynamics Testing at the Langley Research Center

Horta, Lucas G., NASA Langley Research Center, USA; Kvaternik, Raymond G., NASA Langley Research Center, USA; Hanks, Brantley R., NASA Langley Research Center, USA; [2000]; 20p; In English; Dynamics Specialist Conference, 3-6 Apr. 2000, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-1739; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The experience and advancement of Structural dynamics testing for space system applications at the Langley Research Center of the National Aeronautics and Space Administration (NASA) over the past four decades is reviewed. This experience began in the 1960's with the development of a technology base using a variety of physical models to explore dynamic phenomena and to develop reliable analytical modeling capability for space systems. It continued through the 1970's and 80's with the development of rapid, computer-aided test techniques, the testing of low-natural frequency, gravity-sensitive systems, the testing of integrated structures with active flexible motion control, and orbital flight measurements, It extended into the 1990's where advanced computerized system identification methods were developed for estimating the dynamic states of complex, lightweight, flexible aerospace systems, The scope of discussion in this paper includes ground and flight tests and summarizes lessons learned in both successes and failures.

Author

Dynamic Structural Analysis; Dynamic Response; Technology Utilization; Mathematical Models; Ground Tests; Computer Techniques; Active Control

Subject Term Index

A

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